MONTHLY INTERNATIONAL ISSUE

The OIL WEEKLY

WORLD OIL

FOR THE DRILLING, PRODUCING, PIPE LINE INDUSTRY

25 Cents Per Copy — September 1, 1947 — Contents, Page 17

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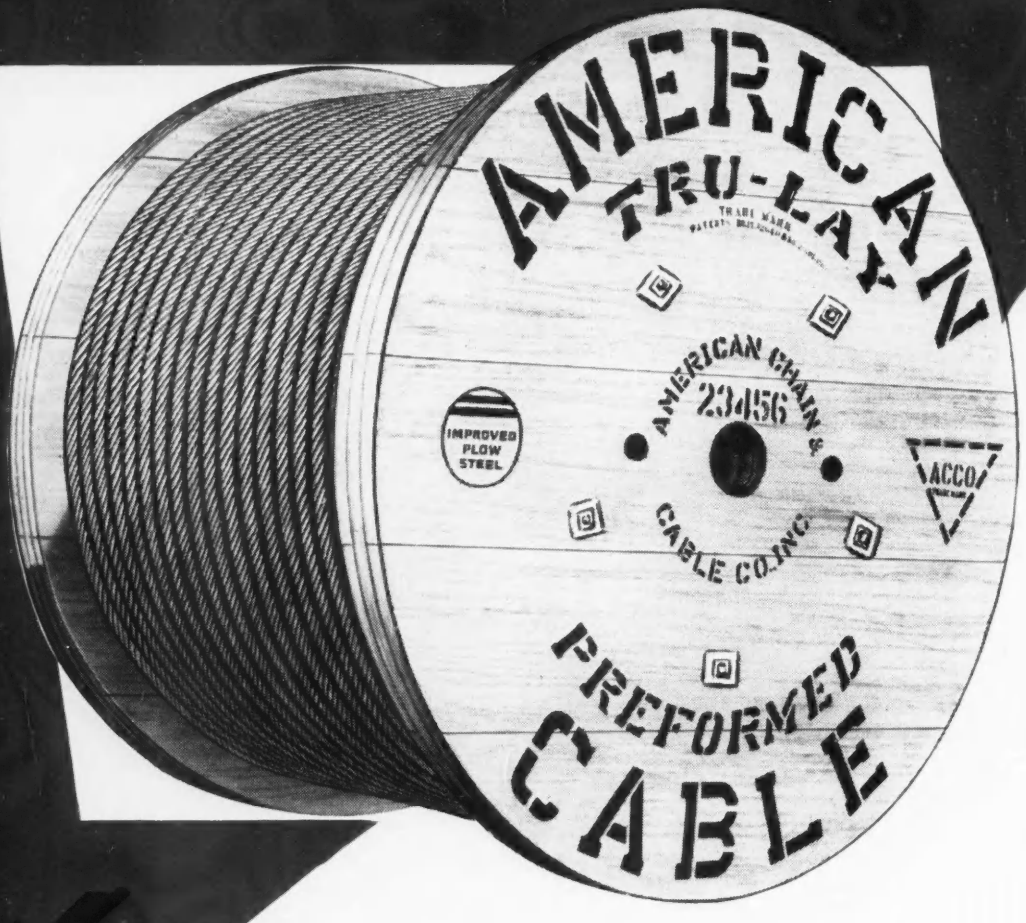

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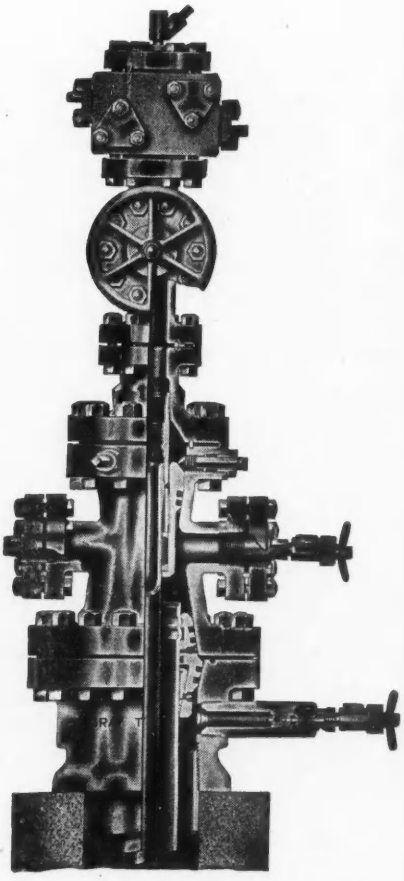

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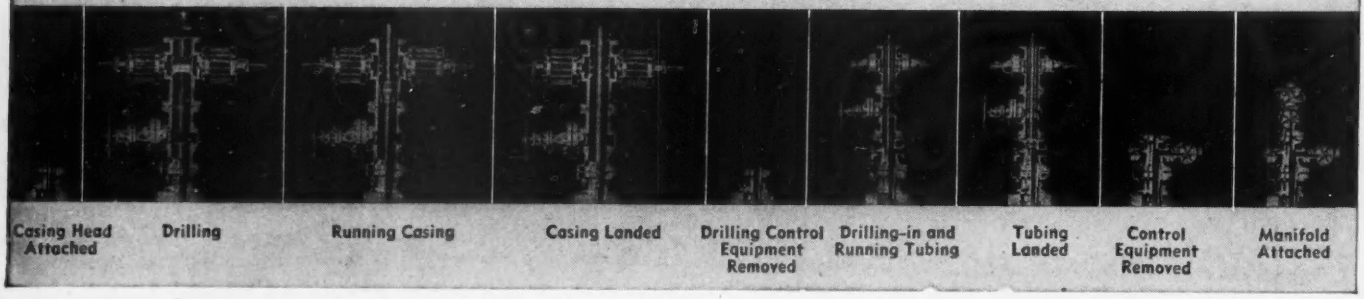

THE OUTLOOK

CHANCES of continuation of the Senate War Investigating Committee after next December 31 are exceedingly dim, as a result of the headline-hunting investigation of Howard Hughes' airplane contracts, coming on top of an equally ambitious and fully as futile attempt to probe Arabian-American Oil Company operations. Extension of the committee barely got through the Senate last January when it still had a good record and reputation.

ON THE BASIS of studies now being made for him, President Truman next year may recommend governmental action to expand steel production capacity, probably through loans for the construction of new plants. The study may agree with the industry that present capacity is adequate to meet normal needs for some years to come, but will stress the importance of increasing output so as to speed the return of normal conditions.

A NEW MATERIAL, in the proportion of 6 percent silica and 94 percent air, is reported to have a lower thermal conductivity than still air. Such an insulator should be effective in preserving the low temperatures necessary for gas liquefaction, and thus assist in development of installations for storing liquefied natural gas.

AIRCRAFT DESIGN is sure to show its influence in the future automobiles. There will be lower bodies, greater visibility and fewer protruding objects. Freakish or fantastic designs are improbable due to public sales resistance.

WITH A NUMBER of major companies acquiring large drilling blocks and buying into smaller refining and marketing companies oil men look for a free-for-all fight in the Rocky Mountain region as soon as materials are available for expansion.

NATURAL GAS shortage will be more pronounced this winter than last winter, as demand will be greater, while scarcity of pipe has prevented material expansion of supply. The demand has been increased through gas furnace installations in homes and through shifting of consumers from coal to oil and gas.

AS PIPE becomes available, the U. S. network of natural gas pipe lines will materially expand. The Southwest will be the outstanding source and origin for pipe lines. While more capacity will be provided to the North Atlantic and North Central states, new lines will be laid also to the South Atlantic states, and a second line to California by 1955 is predicted.

PRICE DECLINES now seem farther away, following new wave of wage and price increases. Purchasing agents feel fairly safe in buying 90 days ahead and the majority of them don't expect buyer resistance to present prices to be important enough to cause letdown or recession of business activity.

OIL MEN from Venezuela predict an early showdown between conservative and radical elements in that country which may lead to internal strife. Typical of Venezuelan labor's attitude toward American oil companies is a recent strike against Socony-Vacuum Oil Company brought about by a demand that the company provide softer cushions for workers on company buses.

CO-OPS hope to enter the production field in Mexico, Venezuela and the Middle East as a challenge to what they term the oil monopoly at home and abroad. Present cooperative method of obtaining supplies by contract is not to taste of Howard A. Cowden, Consumers Cooperative Association head, who declares we "cannot continue indefinitely in such an exposed position."

Knocked for a loop...but–

pumped oil more than a month

THIS "Oilwell" ¾" by 2 ft. grade "S" Pony Sucker Rod was removed from a 4,200 foot well in Kansas after it had been operating in this condition for over a month. The pony rod was located in the rod string just above the pump.

The pulling crew had originally discovered the rods unscrewed near the top of the well and in the process of fishing for the parted rod, the entire string was dropped.

When the rod string was reconnected, operations appeared to be normal. Therefore, pumping was resumed without removing the entire string for checking and the well was pumped for more than a month before pump repairs necessitated pulling of the rods.

The only indications of wear are the minor surface abrasions near each end where the rod rubbed against the tubing with each stroke.

This double bend, achieved within three-inch tubing, demonstrates the extremely ductile qualities of "Oilwell" fully heat-treated sucker rods. Freedom from all indications of stress and fatigue, which were naturally excessive in this coiled position, are convincing evidence of the service life which "Oilwell's" full heat-treatment builds into sucker rods.

"Oilwell" fully heat-treated Sucker Rods

. . . are (1) liquid quenched over their entire length at the correct temperature above the critical range for each type of steel used to secure finest grain structure, (2) tempered over their entire length to control hardness, increase toughness and properly balance properties to resist pumping stresses, and (3) stretch-straightened and proof-tested.

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Oil Companies Show Average Profit Rise

INCREASES in oil company profits this year as compared with last year are in line with gains shown for U. S. industry in general. A recent compilation by the *Wall Street Journal* showed that the aggregate profit of 131 companies in 15 industries in the quarter ended June 30 this year was 84 percent larger than in the June quarter last year. The eight petroleum companies included in the table showed exactly that same 84 percent increased registered by the 131 companies.

A slightly larger list, prepared by this publication, including nine oil companies, showed aggregate profit in the June quarter up only 70.8 percent from last year, which is less than the above cited 84 percent gain for 131 companies.

Industries showing larger gains than petroleum include automobiles and automobile equipment, electric equipment and supplies, machinery and tools, office equipment, pulp and paper products, and railway equipment.

For other industries as well as petroleum, the higher earnings in the June quarter of this year than in the like period last year reflect two main causes: (1) higher prices received and (2) larger volumes of goods sold. Prices still were controlled in the June quarter of 1946, while they were still near their earlier postwar peak in the June quarter of 1947. Volumes of production and sales also were generally greater in this year's June quarter than in the like period last year.

Industry in general had unsatisfactory profit in the June quarter of last year because controlled prices did not compensate for inflated costs. For the oil industry this year's higher profits were particularly essential. Oil company revenue comes from oil developed in the past at much lower cost than must now be paid to replace the oils produced and sold. The industry has to have enough income currently to maintain and expand its operations, despite today's high costs, if it is to continue supplying the oils that the nation wants.

Rail Shipping Problem Will be Long-Lasting

AS WITH other public utilities, railroad transportation is taken for granted. A sidelight on rail transportation difficulties in the oil industry is thrown by the statement that the Class A railroads scrapped 5183 more freight cars than were put in service during the first half of 1947. Increase of more than 7500 cars placed on order—bringing the total up to 109,556 as of July 1—is further indication that life of rolling stock was exhausted by wartime exigencies. It will be a long time before cars are instantly available for shipping petroleum products, as well as bringing in industry requirements of raw materials and equipment.

The industry must place still greater reliance on other forms of transportation, water, highway or pipe line, if it is to keep up with the demands made on it.

Shared Shortage

DESPITE the critical shortage of tubular goods and other steel products the oil and gas industry has not suffered as greatly as other steel-consuming industries. The petroleum industry received 4.1 percent of the finished steel products shipped in 1946 as compared with 3.6 percent in 1940.

The automobile industry, which received 15.7 percent of the finished steel shipments in 1940, obtained only 12.5 percent in 1946. The important construction industry also received less steel, getting 7.8 percent of the shipments in 1947 in contrast with 8.2 in 1940.

What Is the Matter With Oil? We Ask

ANY day, perhaps, some resolute, not to say reckless, individual may yet take his life in his hands on the subject of Oil. He hears the Truman plan for Greece and Turkey airily dismissed in one word, Oil. He hears the whole question of the Near and Middle East, not excluding Palestine, tersely summed up in one word, Oil. Thereupon this reckless person, instead of shrinking back into discomfiture and silence may actually come back sharply and ask what is the matter with oil? What is there wrong about the U. S. and Britain being strongly interested in Arabian oil and the oil of Iraq and Iran?

This unabashed controversialist may take it upon himself to point out that . . . Oil is the common man's commodity. For example, 30 million American families consider gasoline a daily necessity next only after bread and meat . . .

In the history of Oil there have been Oil barons and Oil scandals, but other chapters in the history would deal with (1) that famous Paris taxicab army of September, 1914, which Gallieni threw against Von Kluck's right flank, and so helped produce the miracle of the Marne; (2) the oil that drove the Sherman tanks which we threw into the British line against Rommel when he stood almost at the gates of Alexandria, and so helped produce the near-miracle of El Alamein; (3) the aforesaid trucks and tanks for Russia when the Nazi armies stood on the Volga and deep in the Caucasus . . .

It is odd how people in the midst of explaining how completely the world has changed in everything—a world changed "beyond recognition"—will all at once slip back into the formulas and slogans and cliches of a generation ago, as though nothing in the world has changed . . . But that is only another example of how the ultra-modern mind can become very old-fashioned at times.

—Condensed from NEW YORK TIMES.

This *Revolutionary* new kind of rotary hose obsoletes all others

Goodall "FLEXO" Long-Life Rotary Hose is built on a revolutionary new principle of construction to give higher strength and greater flexibility than ever believed possible.

It lasts so long it cannot be compared with any other hose.

It is the strongest hose built—and it retains this higher strength better than ordinary hose.

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The Barney Coupling—the strongest, longest life coupling yet developed—is standard equipment on this new hose.

It's lighter weight and greater flexibility make it easier to move and install. No special loading rack is required.

You get all this "premium" service at the standard price. Order Goodall "FLEXO" the next time you need a rotary hose. You can order it with confidence because it is built by Goodall—originators of high pressure hose and, for years, an established leader in rotary hose manufacture.

BARNEY COUPLINGS—the only couplings stronger than the hose—are standard on Goodall Flexo Rotary Hose.

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THE WEEK'S NEWS

26-Inch Lines to Step Up Transmission Of Gas to California are Projected

El Paso Natural Gas Company of El Paso, Texas, last week filed application with FPC for a certificate authorizing construction and operation of a $55,395,350 project designed to make available to California an additional 200 million cubic feet of natural gas per day.

El Paso was granted a certificate by the commission last year to construct a $53,800,000 project which is intended to make possible delivery of a total of 505 million cubic feet of gas per day to California distributors, and this project is currently under construction.

The newly propored project calls for a 26-inch transmission loop line which would increase by 100 million cubic feet per day the delivery capacity of a previously authorized 26-inch line from Lea County, New Mexico, to the Colorado River near Blythe, Calif. This loop line would be 438 miles long. Also newly proposed is construction and operation of a 26-inch transmission pipe line from San Juan County, New Mexico, 470 miles to the California-Arizona border near Needles, Calif. This line would have an initial capacity of 100 million cubic feet per day.

It is intended to begin construction of the proposed facilities in 1951 and to complete them so that gas from San Juan County could be delivered to California about January 1, 1952. The construction schedule plans delivery from Lea County to Blythe beginning in 1952 or 1953 as the demands for natural gas in California may require.

Federal Tax Collections On Gasoline Sales Decline

Federal tax collections on gasoline sales declined $2,067,485 to a total of $38,581,556 during July, it was announced last week by the Bureau of Internal Revenue of the Treasury Department. During July, 1946, gasoline taxes yielded $36,622,309.

The tax on transportation of oil by pipe line amounted to $1,349,429 during July, which compared with $1,962,756 in June and $1,392,506 a year ago. Lubricating oil taxes yielded the Treasury $5,558,429 in July, $7,701,375 in June and $9,071,041 in July, 1946.

Synthetic Fuels Production Has Great Future—Boyd

James Boyd, new director of the Bureau of Mines, last week predicted that the production of synthetic fuels will establish itself as a great industry in this country in a few years. Boyd was given an interim appointment to the Bureau post earlier in the week by President Truman over the protests of John L. Lewis and his United Mines Workers Union.

Congress last session voted $30 million for expenditure over a five-year period for experimental work in production of synthetic liquid fuels from coal and other products and the bureau has in operation or under construction demonstration plants at Laramie, Wyo., Rifle, Colo., Bruceton, Penn., and Louisiana, Mo.

Boyd said he thought the government should operate these plants only until the private industry gets on its feet.

Gasoline Octane Ratings Higher, Says Mines Bureau

Octane ratings of regular and premium-priced gasoline sold in the U. S. during the winter of 1946-47 showed an improvement over the ratings of the preceding summer, according to the semi-annual survey of motor gasoline released last week by H. Miller, acting director of the Bureau of Mines.

The survey showed that the average octane rating of regular-price gasoline last winter was 75.0, compared with 74.4 the previous summer, and the average octane rating for premium price gasoline last winter was 78.5, compared with 78.3 for the summer of 1946.

U. S. Sells Refinery

Sale of the government's $21 million high-octane gasoline refinery at Richmond, Calif., to Standard Oil Company of California for $6 million was announced last week by WAA. Since bidding on the plant closed June 20, the sale did not come under the recently announced WAA plan to give preferential consideration to offers guaranteeing a portion of refinery output to the Army and Navy.

Standard of California was the only bidder for the plant. It will pay 20 percent of the bid price and the balance in 90 months.

Greater Output of Steel Forecast

A slightly higher output of steel for the week ended August 30 was forecast last week by the American Iron and Steel Institute when it placed the operating rate of the reporting steel companies at 93.4 percent of capacity as compared with 92.8 percent for the previous week. A month ago the operating rate was 94.4 percent and a year ago it was 89.4 percent.

The week's operating rate is equivalent to 1,633,700 tons of steel ingots and castings, compared with 1,623,900 tons one week ago, 1,651,900 tons one month ago, and 1,575,600 tons one year ago.

Diesel Oil, Aviation Gasoline Lack Is Easing, Says Navy Man

Captain Ralph E. Wilson of the Army and Navy Petroleum Board reported last week that definite signs of relief from the critical shortage of Navy special diesel oil and aviation gasoline are now in sight.

He said that while the general situation is far from being totally satisfactory, the supply status is much better than a month ago and during the first six motnhs of the 1948 fiscal year 90 percent of the overall military needs are in sight.

"Beyond these first six months, however, the situation is still cloudy," Capt. Wilson said. "Right now it looks like 50 percent coverage for the last half of the current fiscal year. This is likely to improve later."

He said the Navy is bringing in about 500,000 barrels a month of Navy special diesel oil to the eastern seaboard from the Persian Gulf and remarked that "We'd be in a jam if we were not getting that amount to supplement the domestic supply."

Texas Wildcatting Increases, Rail Group's Figures Show

Wildcatting in Texas during 1947 has shown an increase over 1946, according to a report by the Railroad Commission. During 1947, 1007 wildcats have been drilled, compared with 868 at this time in 1946.

Of the wildcats drilled, 813 have been dry holes this year, compared with 740 last year. Completed for oil have been 147, well above last year's 97, while 47 have been completed for gas, compared with 31 last year.

Regular drilling aplications this year have totaled 5895, compared with 4733 last year. For 1947, completions total 3603 for oil and 386 for gas. Last year to date oil completions had totaled 2982 and gas completions were ahead of this year, totaling 424.

Rule 37 applications were also up this year, with 1092 filed as against 792. Rule 37 permits granted this year total 874, well ahead of last year's 664. Denials are the same, 26 for each period.

During the week ended August 23, applications for regular drilling permits, 203, were exactly equalled by the number of wells plugged. This year, 4137 wells have been plugged, compared with only 2977 for the same period last year.

Stocks Slump

The Bureau of Mines reported last week that stocks of domestic and foreign crude petroleum at the close of the week ended August 16 totaled 226,076,000 barrels, representing a decrease of 1,703,000 barrels below the 227,779,000 barrels for the preceding week. The decrease comprised a decrease of 2,155,000 barrels in stocks of domestic crude and an increase of 452,000 barrels in stocks of foreign trade.

Natural Gas Company Cost Study Released by FPC

The FPC last week issued a study of "Natural Gas Company Cost Units" based up on plant investment costs and operating expenses reported by 87 large natural gas companies for 1945. The studies provide data which may be used in comparing construction costs and operating expenses of individual companies with the experience of the industry in general.

Construction costs have been developed in considerable detail and analyses of individual items have been extended to show differences due to various factors. For example, the construction cost per horsepower of installed capacity of a transmission compressor station may be compared with the average cost of other stations of the same size and constructed during periods of comparable price levels. Average costs of structures and improvements and of equipment as well as total costs are shown.

Page Named Acting Head of Government Oil Needs Group

Howard W. Page, executive assistant to the president of Standard Oil Company (N. J.) was named acting chairman of the Committee on Military and Government Petroleum Requirements last week by Walter S. Hallanan, chairman of the National Petroleum Council.

Page, who has been a member of the committee since its organization and is chairman of the subcommittee, will direct activities during the absence of Colonel J. Frank Drake, chairman. Col. Drake president of Gulf Oil Corporation, had asked that he be allowed to resign the chairmanship of the committee since he will be out of the U. S. a greater part of the next three and one-half months, but Hallanan refused to accept the resignation and proposed instead that an acting chairman be appointed.

Interior Department Alters Rules on Dating of Leases

The Bureau of Land Management of the Department of the Interior has modified its rules relating to the dating of competitive and non-competitive oil and gas leases.

The changed rule now states that all competitive and non-competitive oil and gas leases will be dated as of the first of the month following the date the leases are signed on behalf of the lessor except that when prior written request is made a lease may be dated the first of the month within which it is so signed.

Price Fixing Probed

An investigation of alleged price fixing and other antitrust law violations in the sale and distribution of gasoline in the Greater Washington area was started last week by the District of Columbia grand jury at the request of Attorney General Tom C. Clark.

Texas Well Permits

Permits to drill 295 new wells in Texas were approved by the Texas Railroad Commission last week. There were 70 in North Texas and 70 in Southwest Texas. West Texas reported 53 permits, and there were 30 from East Central Texas, 23 from the Gulf Coast, 35 from West Central Texas, and 14 from the Panhandle.

Record-Breaking Trend of Crude Production Continues

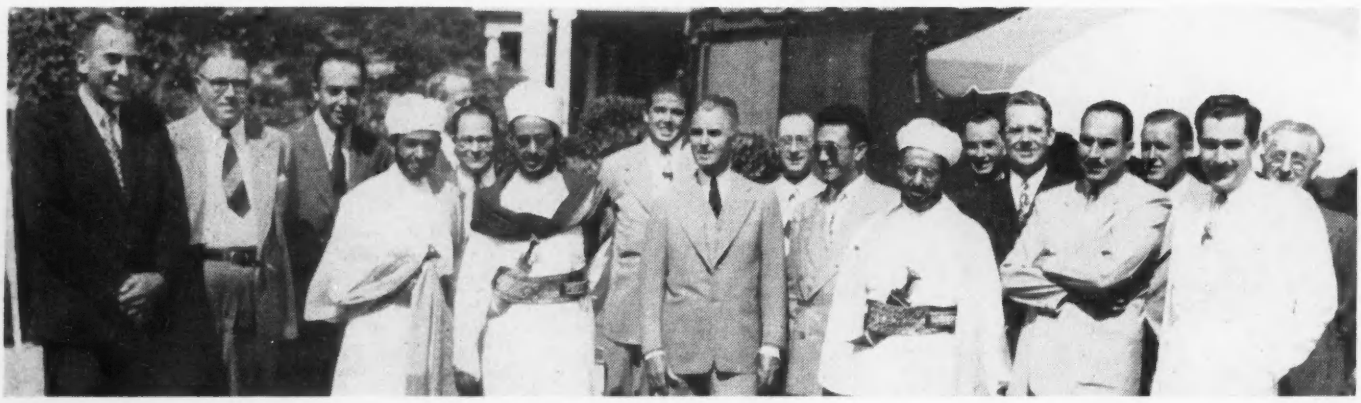
The record-breaking trend of crude production was continued during June when producers' output reached a daily average of 5,099,000 barrels, exceeding the May record by 66,000 barrels, the Bureau of Mines announced last week. The increase in Texas production accounted for 59,000 barrels daily of the total gain with small increases reported in several other states.

A drop of 103 from May in the oil well completions was noted, however, although the June total of 1523 was still above the average for the first six months of the year. Active drilling rigs on June 30 were 4291, compared with 4455 on May 21 and 3870 on June 30, 1946.

The daily average demand for domestic crude increased 108,000 barrels over May to set a new record at 5,100,000 barrels daily. Stocks of domestic crude changed very little in June, a reduction of only 1000 barrels daily being recorded. Total crude stocks, domestic and foreign, were 242,707,000 barrels at the close of the month, compared with 243,593,000 at the end of May.

A new record was set also for crude runs to stills. They increased 73,000 barrels daily to 5,120,000 barrels daily in June. Total stocks of refined products amounted to 248,502,000 barrels on June 30, a gain of 5,600,000 barrels during the month. Stocks of finished gasoline declined 5,600,000 barrels, making an unusually large withdrawal of 15,800,000 barrels for the second quarter. Demand for all oils in June averaged 5,642,000 barrels daily with exports of 480,000 barrels daily and a domestic demand of 5,162,000 barrels daily. Imports of all oils in June averaged 378,000 barrels

Prince of Yemen and Oil Men Who May Drill in His Country



Prince Saif al Islam Abdulla of the Kingdom of Yemen, Arabia, who recently completed a tour of U. S. industrial centers, is shown above with his entourage and a group of oil men who entertained him while he was in Southern California. The oil men are executives of companies which recently formed the American-Independent Oil Company to engage in oil operations in the Middle East. Pictured, left to right: R. H. Green, Signal Oil and Gas Company; J. W. Paulson; Hasan Baghdabi, Bey; His Excellency Said Hasan Abrahim, son of the commander in chief of the Yemen army; H. J. March, Signal Oil and Gas; Dr. Adnan Tarcici, advisor; the Prince of Yeman; Patrick A. Doheny, Los Nietos Company; R. K. Davies, president American-Independent Oil Company; Howard Smith, Honolulu Oil Corporation; George Wakin, interpreter; His Excellency Muhammad al Amri, son of the prime minister of Yemen; G. W. Reed, Los Nietos; Vernon Barrett, Hogan Petroleum Company; Muhammad Khattab, Bey; Laurence Doheny, Los Nietos; Hussein Abdulla, advisor; Fred S. Sedding, Los Nietos.

Prince Adbulla last week announced that he is considering the granting of oil concessions in Yemen to the American-Independent concern. The grant, if made, would include the right to survey and drill throughout Yemen.

daily. Total exports have exceeded imports by about 54,000 barrels daily in the second quarter. The total demand for motor fuel amounted to 75,600,000 barrels in June and was 217,500,000 for the second quarter.

The Bureau estimated total production in June at 163,483,000 barrels against 166,416,000 in May, consisting of 152,978,000 barrels of crude against 156,024,000 in May, 10,455,000 barrels of natural gasoline against 10,342,000 in May, and 50,000 barrels of benzol, the same as during May. With the addition of 7,628,000 barrels of imported crude and 3,711,000 barrels of refined, the total new supply, all oil for June, reached 174,822,000 barrels. In May the total was 180,744,000 with the addition of 8,703,000 barrels of imported crude and 5,625,000 barrels of imported refined products. The daily average for the new supply was 5,827,000 in June against 5,830,000 in May.

The June total demand was 169,265,000 barrels, a daily average of 5,642,000, against 172,944,000 in May with a daily average of 5,579,000 barrels. Exports of crude petroleum totaled 3,758,000 for the month against 4,789,000 in May and of refined products 10,637,000 against 9,523,000 barrels. Domestic demand was broken down into the following:

Motor fuel, 71,329,000 barrels against 70,865,000; kerosene, 5,910,000 against 6,068,000; distillate fuel oil, 16,977,000 against 19,262,000; residual fuel oil 38,327,000 against 40,057,000; lubricating oil, 2,873,000 against 3,104,000; wax, 206,000 against 219,000; coke, 765,000 against 888,000; asphalt, 4,611,000 against 3,859,000; road oil, 749,000 against 718,000; still gas, 7,589,000 against 7,445,000; liquefied gases, 3,604,000 against 3,566,000; other miscellaneous, 332,000 against 325,000; loses, 1,688,000 against 2,556,000; total 154,870,000 against 158,632,000.

Stocks at the close of the month included 237,278,000 barrels of gasoline-bearing crude against 237,768,000 barrels at the end of May; 5,429,000 barrels of heavy crude in California against 5,825,000; 5,452,000 barrels of natural gasoline against 5,566,000; refined products, 248,502,000 against 241,945,000. Total all wells, 496,661,000 barrels against 491,104,000 barrels.

The price index for petroleum and petroleum products was 87.5 in June, compared with 86.8 in May and 64.0 in June, 1946, according to the Bureau of Labor statistics. The crude capacity represented by the report was 5,257,000 barrels daily, indicating an operating ratio of over 97 percent in June compared with 95 percent in May.

Wartime Taxes Blamed For Soaring Prices

Charges that the continuing wartime excise taxes on gasoline, oil, and other products used by the transportation industry are responsible in part for the present high level of prices were made last week by John V. Lawrence, managing director of the American Trucking Associations, Inc.

He said Congress can start the ball rolling toward lower prices by repealing these excises. These taxes, he stated, constiute a heavy burden on every truck, bus and automobile owner in the country and the higher transportation costs that result from them add considerably to the prices ultimately paid by the consumer.

Lawrence declared that during the fiscal year ended June 30, the federal government collected $82 million from the 6 cents a gallon tax on lubricating oils, an increase of 10 percent over the previous year, and $433 million from the 1½ cents per gallon tax on gasoline, an increase of $28 million.

"Unquestionably, transportation costs would go down with repeal of the excise taxes," he stated.

Imports of Crude and Products Decline

Daily average imports of crude petroleum and petroleum products declined to 400,923 barrels in June from an average of 473,469 barrels for the first half of the year, it was announced by the Department of Commerce. Total imports for the month were only 12,027,698 barrels, the lowest monthly figure recorded this year. May's import figure was 14,617,270 barrels.

The department said the decrease in June was due to lower receipts of residual fuel oil, chiefly from the Netherlands West Indies, which fell from 5,326,980 barrels in May to 3,171,638 in June. Total imports of 85,697,964 barrels during the first six months of 1947 were 21.5 percent greater than during the same period of last year. The average value of crude imports was $1.65 per barrel in June and $1.55 for the first half of 1947.

Exports of crude petroleum and petroleum products continued at a high level in June and averaged 444,297 barrels daily compared with 417,599 barrels daily during the first half of 1947 and 409,543 in the first half of last year. Exports in June exceeded imports for the first time this year, although there was an import balance for the six months of more than 10 million barrels.

A table giving U. S. foreign trade in petroleum and products for June and the first six months of 1946 and 1947 follows. Data are based on preliminary tabulations of the Bureau of Census. They cover the foreign trade of the U. S., its territories, and possessions. Trade between the continental U. S. and the territories and possessions is not included.

	(In Barrels)		
	June, 1947 (Preliminary)	January-June, 1947 (Preliminary)	January-June, 1946
Imports:			
Crude Petroleum	8,330,419	52,242,293	44,992,444
Gasoline	70,131	306,604	230,552
Gas Oil and Distillate Fuel Oil	254,118	2,071,208	3,599,217
Residual Fuel Oil	3,171,638	30,285,842	21,369,048
Unfinished Oils	21,714	52,295	.....
Other Petroleum Products	179,678	739,722	350,945
Total Imports	12,027,698	85,697,964	70,542,206
Daily Average	400,923	473,469	389,736
Exports:			
Crude Petroleum	3,757,876	20,869,663	18,036,072
Natural Gasoline	497,809	2,296,251	1,222,408
Aviation Motor Fuels	313,625	1,612,894	2,498,713
Other Motor Fuels	2,962,417	18,221,955	19,137,655
Kerosene	711,393	4,143,570	4,352,782
Gas Oil and Distillate Fuel Oil	2,088,305	11,759,975	17,045,268
Residual Fuel Oil	678,669	4,025,027	2,487,776
Lubricating Oil and Grease	1,398,872	7,853,415	5,563,773
Paraffin Wax	76,485	518,308	358,626
Other Petroleum Products	843,453	4,284,417	3,424,203
Total Exports	13,328,904	75,585,475	74,127,276
Daily Average	444,297	417,599	409,543

Source: Bureau of Census; products recorded in units other than barrels were converted as follows: liquefied petroleum gas, 190 pounds per barrel; paraffin wax, 280 pounds per barrel; coke, 5.6 barrels per long ton; asphalt, 6.16 barrels per long ton; petrolatum, 280 pounds per barrel; grease, 350 pounds per barrel.

Salt Water Bonus Allowables In East Texas Field Attacked

The Texas Railroad Commission's practice of giving salt water bonus allowables to operators in the East Texas field is under attack in the 126th District Court in Austin. Joe B. Holcomb of Kilgore and others brought suit against the commission and operators of leases adjoining the plaintiffs.

It is contended that the commission's water injection premiums are illegal because they deprive owners of equal rights. A permanent injunction restraining the granting of the premiums is sought, in addition to $125,000 actual damages and $30,000 exemplary damages against the oil companies.

Holcomb's attack is based on that portion of the rule which permits producers who receive premium allowables to sell them to other wells in the field. The petition declares that this traffic in allowables mitigates against those who cannot earn or buy premiums.

The order attacked gives six barrels per day as the maximum premium for water injection.

Lands Transferred

Jurisdiction over oil and gas deposits of about 137 acres of public lands in Muskingum County Watershed Conservancy District Fairfield and Dover Townships, Tuscarawas County, Ohio, were transferred to the Department of the Interior from the War Department last week to protect the government's interest in the deposits.

Delta, AIME to Meet

"Plastic Cement Mixes" will be discussed by a representative of Halliburton Oil Well Cementing Company at the first fall meeting of the Delta Section, AIME, September 9, at the Petroleum Club, New Orleans, at 7:30 p.m.

50-Mile Oklahoma Crude Line Planned by Mid-Continent

Mid-Continent Pipe Line Company, modernization program involving ex- Tulsa, announced an expansion and penditure of more than $2 million, including construction of a crude line into the McClain-Garvin area of Oklahoma.

The line will be a six-inch carrier, 50 miles long, with a 14-mile, four-inch connecting line into Pauls Valley, Okla., and will extend from the southwest edge of the St. Louis pool through the Wayne area to a point a short distance east of the Lindsay pool. Then it will extend south through the Maysville and Antioch areas to a point a short distance north of Eola. A pumping station will be constructed midway on the new line where oil will be relayed to the main line pumping station in the St. Louis pool. Initial capacity will be 7500 barrels daily and this eventually will be increased to 12,500 barrels by additional pumping units.

The company also will replace all engines and pumps at its Drumright station and will increase the station's capacity.

Nation's Gas Pipe Line System Greatly Expanded in Year

Construction and operation of new facilities to increase the capacity of the nation's natural gas pipe line systems by nearly 2 billion cubic feet daily were authorized by the FPC between July 1, 1946, and June 30, 1947.

Cost of the facilities authorized were estimated at $273,190,302, of which an estimated $257,448,776 was for projects costing $700,000 or more each. These larger projects were planned to benefit nearly 80 major cities and numerous smaller communities in 20 states, many of them in the Appalachian and Midwestern areas where gas shortages have been prevalent. The new construction was intended to add at least 1,861,000,000 cubic feet daily to the aggregate capacity of the systems involved.

Operators of Inch Lines Win Commendation from RFC Head

Millions of dollars accrued to the federal government from the Big Inch and Little Big Inch pipe lines. At the same time consumers profited by a saving in transportation cost of $290 million from January, 1943, through October, 1945.

Chairman John D. Goodloe of the Reconstruction Finance Corporation, in officially terminating construction and operating agreements, revealed these facts in a letter "of commendation and appreciation" to W. Alton Jones, president of Cities Service Oil Company, who headed up War Emergency Pipelines, Inc., which built and operated the Big and Little Big Inch.

"From both military and economic standpoints the lines more than met expectation," wrote Goodloe. The net return to the government was approximately $182 million, exclusive of depreciation. This compares with a government capital investment of $145 million, which is substantially the sum for which the system was recently sold. The government also effected a heavy saving in oil transportation directly resulting from the $290 million difference in the costs for pipe line deliveries and the more expensive charges which would have been necessary for tank car deliveries provided tank cars could have done the job."

FPC to Hear Arguments On Inch Lines Purchase Plan

Arguments will be heard September 22 by FPC on the application of Texas Eastern Transmission Corporation to acquire and operate the Big and Little Big Inch lines for the transmission of natural gas and to construct additions to the lines.

Oral argument was granted upon consideration of a motion filed by the company requesting that the commission find that "due and timely execution of its functions imperatively and unavoidably requires that it forthwith render the final decision herein," and "that the commission require that oral argument be had before the commission in lieu of the filing of briefs."

Crude Oil Production in the United States

(Estimates compiled by WORLD OIL. All figures indicate daily averages in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED August 30	August 23
Alabama	1,100	1,200
Arkansas	76,000	76,000
California	927,400	923,300
Colorado	48,900	48,000
Florida	1,100	975
Illinois	171,300	168,000
Indiana	17,000	17,000
Kansas	303,750	297,850
Kentucky	25,200	25,500
Louisiana	429,750	428,050
North Louisiana	99,700	98,000
South Louisiana	330,050	330,050
Michigan	43,000	44,000
Mississippi	101,450	101,300
Missouri	100	100
Montana	23,800	23,800
Nebraska	550	550
New Mexico	108,550	108,550
New York	13,050	13,200
Ohio	9,100	9,100
Oklahoma	393,250	391,650
Pennsylvania	34,500	34,800
Tennessee	25	25
Texas	2,306,050	2,306,050
Tex. R. R. Comm. Districts:		
Dist. 1—South Central	23,600	23,600
Dist. 2—Middle Gulf Coast	161,200	161,200
Dist. 3—Upper Gulf Coast	487,400	487,400
Dist. 4—Lower Gulf-S.W.	245,200	245,200
Dist. 5—East Central	39,500	39,500
Dist. 6—East Texas Field	324,000	324,000
Dist. 6—Rest of Northeast	116,800	116,800
Dist. 7-B—North Central	39,400	39,400
Dist. 7-C—West Central	39,600	39,600
Dist. 8—West	618,200	618,200
Dist. 9—North	127,550	127,550
Dist. 10—Panhandle	83,600	83,600
Virginia	150	200
West Virginia	7,500	7,300
Wyoming	122,000	121,000
Total United States	5,164,575	5,147,500

Total stocks, foreign and domestic, August 23, as reported by the Bureau of Mines were 227,642,000 barrels.

Cities Service Authorized To Build Oklahoma Lines

Cities Service Gas Company, Oklahoma City, has been granted temporary authorization from the FPC to lay pipe lines to take additional gas from the west side of its system to the east side. The company proposes to lay a line near Guthrie to its Oklahoma City-Drumright, Okla., trunk line. It will tear up lines in the southern part of the Greater Seminole area and use the materials in the new project. Work on construction, estimated to cost approximately $881,000, will start immediately to permit the company to meet peak demands during the next two winters.

Abandonment of Clay County, Texas, Line Is Requested

Permission to abandon its Petrolia pipe line and gathering system in Clay County was requested by Toronto Pipe Line Company at a hearing before the Texas Railroad Commission last week.

N. A. Ludewick, general superintendent for the applicant, testified that the system, which is the only one serving the Petrolia and A and P fields, is losing money. It appears from the evidence that present needed repairs would cost some $4000 to $5000. The oil gathered by the system is pumped to The Texas Company station at Henrietta.

If the applicant is permitted to abandon the system, it proposes to move the pipe to areas of active operations, unless, of course, the operators in the area buy and operate it. In the event of abandonment, said Ludewick, Toronto plans to move the oil by truck.

Stanolind to Build 13-Mile Line from Wyoming Field

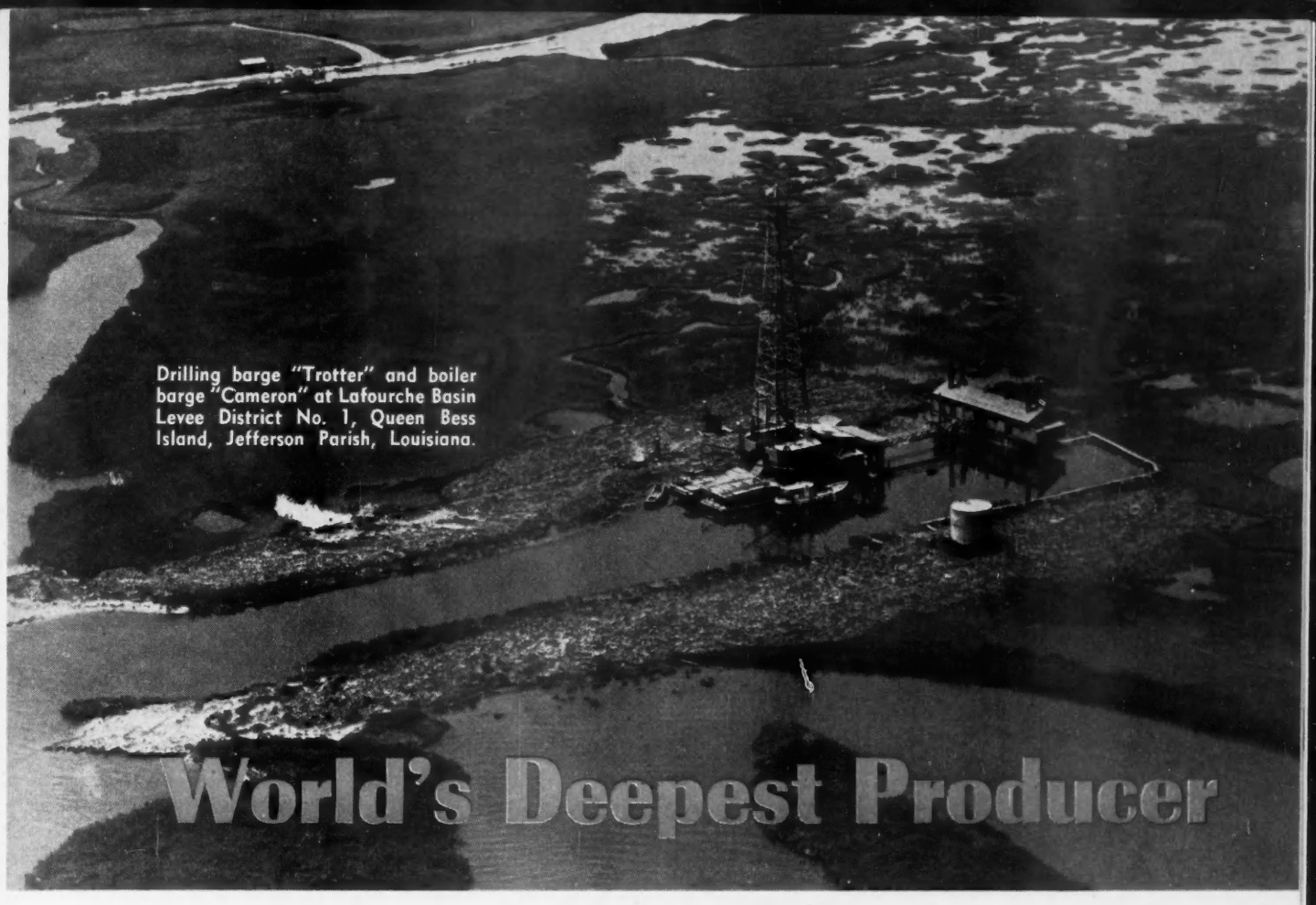
Approval has been given by Wyoming Public Service Commission for construction by Stanolind Pipe Line Company of 13½ miles of eight-inch oil line from the Hamilton Dome field, Hot Springs County, Wyoming, to a junction on Stanolind's main line from the Elk Basin field to Casper. Construction is to start immediately. The field produces approximately 7000 barrels of oil daily, with Argo Oil Company as the principal operator in the field.

Contract Awarded

C. L. Rogers Construction Company, Wichita Falls, Texas, has been awarded contract by The Texas Pipe Line Company to lay 23 miles of eight-inch crude line from the Antioch pool, Garvin County, to the Velma pool, Stephens County, Oklahoma. Work is to begin shortly.

Correction and Apology

An item in the August 18 issue of WORLD OIL erroneously referred to Walter Teagle, former president of Standard Oil Company (N. J.) as the *late* Walter Teagle. We regret the blunder, are happy to correct it. Sincere apologies to Mr. Teagle.



Drilling barge "Trotter" and boiler barge "Cameron" at Lafourche Basin Levee District No. 1, Queen Bess Island, Jefferson Parish, Louisiana.

World's Deepest Producer

DEEP in the bayou country of Coastal Louisiana is The Texas Company's Lafourche Basin Levee District No. 1, world's deepest producing well. Yielding gas and condensate from lowest perforations at 13,904 feet, the well exceeded by 16 feet the former record for deep production set by Shell Oil Company's Smith State Unit 1, Well No. 3, Weeks Island field of Iberia Parish, Louisiana, where the lowest producing horizon is at 13,888 feet. The Weeks Island producer, brought in on March 29, held the deepest producing record for little more than four months, when the new record was established July 23, upon completion of the Queen Bess Island well.

The deepest producer, located 1500 feet south and 300 feet east of the northwest corner of 30-20s-25e, is the third well to be drilled by The Texas Company on the Queen Bess Island structure. It is approximately 76 miles east of Weeks Island and 30 miles south of New Orleans, situated well in the protective waters of Barataria Bay, Jefferson Parish.

While accredited with being the world's deepest producer, the Queen Bess Island well is primarily a gas well, making an initial gauge of 6,188,296 cubic feet of gas, 48 barrels of 40.8-gravity fluid and no basic sediment and water through ¼-inch choke per day, with 4200 pounds pressure on the tubing while flowing. The Weeks Island well currently produces 410 barrels of 33-gravity oil through 11/64-inch choke with 2800 pounds tubing pressure from a production interval at 13,867-88 feet. Gas-oil ratio was 1200.

In addition to being the deepest producer, the well is reported to be the deepest ever drilled in Louisiana, having a total depth of 15,523 feet. Sidewall cores from 13,258-15,440 feet are reported to be the deepest cores taken by this method. Four feet of core was recovered through conventional methods from 15,489-493 feet, the deepest taken in the well.

Well History

A total of 219 days were required to drill the Lafourche Basin Levee District No. 1. Begun November 17, 1946, 17½-inch surface hole was drilled to 2980 feet where 13⅜-inch outside diameter casing was cemented. From this depth to 12,004 feet, 11¾-inch hole was made, using 4½-inch 16.60-pound grade E drill pipe and four 7¾-inch OD drill collars. The 8⅝-inch OD casing was floated from 7642-12,004 feet where it was cemented with 1000 sacks of slow-set cement. Maximum weight recorded during running of the 8⅝-inch string was 346,000 pounds. Calculated weight of the string in air was approximately 525,000 pounds.

A 7⅞-inch hole was drilled below the 8⅝-inch protection string to total depth of 15,523 feet using 3½-inch OD 13.30-pound grade E drill pipe and 12 drill collars measuring 5½ inches in diameter by 30 feet in length. The drill collars weighed 23,000 pounds. Drilling was discontinued at this depth and a full string of 5½-inch OD casing was set to 13,998 feet.

A packer was set at 6 o'clock on the morning of completion, July 23. On a ⅛-inch choke, the well developed 4550 pounds tubing pressure and was permitted to flow until noon at the rate of 1,938,984 cubic feet per day. Some heads of drilling mud were also made. At noon, a larger choke, 11/64-inch, was installed, and the well flowed for three hours at the rate of 3,172,896 cubic feet per day along with some 44.1-gravity fluid. Tubing pressure remained at 4550 pounds per square inch. On a 3/16-inch choke, gas production increased to the rate of 4,144,996 cubic feet per day, with tubing pressure unchanged. Choke was increased to ¼-inch and on a two-hour test, the well flowed at the rate of 6,188,296 cubic feet of gas, 48 barrels fluid, no water per day, during which time the tubing pressure dropped to 4200 pounds.

Men who aided in drilling Lafourche Basin Levee District 1. Derrick floor: left to right, C. F. LeBouef; R. E. Posey, Jr., derrickman; S. J. Landry, fireman; R. A. Hornsby; N. A. Sellers; J. H. Anderson, driller. Back row, Sam Hattaway, foreman. Pipe rack: standing, M. L. Latta, relief foreman. Left to right, L. P. Knight, E. Daigle, J. N. DeSoto, R. H. Fournier, A. J. Henry and Dave Bear, driller.

The well was flowed into a high-pressure separator with back pressure varying from 600 to 200 pounds per square inch. Subsurface pressure at the top of the producing perforations gauged 6234 pounds with shutin tubing pressure at 4830 psi.

Mud Program

The mud program consisted of normal weight fluid at 9.8 pounds per gallon up to 10.4 pounds per gallon to a depth of 12,004 feet. After setting the 8⅝-inch casing, the mud was converted to a high pH starch mud by the addition of caustic and quebracho. At 14,500 feet, viscosity of the mud was difficult to control. The use of barium carbonate brought the viscosity down to desirable values. From 15,000 feet to total depth, the viscosity was controlled with caustic, quebracho and water.

No difficult fishing jobs were experienced. A twistoff in the bottom drill collar occurred at 6755 feet, but was fished out without trouble. At 10,507 feet, the bottom drill collar twisted off again, but was easily recovered. A rock bit cone was lost at 12,656 feet, but retrieved with a sidedoor basket. Part of a small cone was lost at 13,611 feet, but no attempt was made to recover it.

Below is the casing program for the 8⅝-inch casing string. The floating equipment consisted of one washdown shoe and two float collars. The pipe was filled while running to 7642 feet, after which no additional mud was placed in the casing. From this depth the string was floated to bottom. The maximum weight just prior to landing the protective string was 75 points (346,000 pounds). When the casing touched bottom, weight slacked off to 55 points. Circulation was broken and maintained at 800 pounds for one hour and 18 minutes before mixing cement. Recorded weights checked rather closely to the calculated values, indicating very little friction or drag in the hole. The block was strung with twelve 1⅛-inch drilling lines to run the casing.

Top of Hole:
1,196′—8-5/8″ OD 49.00 # Gr. N-80
1,106′—8-5/8″ OD 44.00 # Gr. N-80
4,203′—8-5/8″ OD 40.00 # Gr. N-80
5,231′—8-5/8″ OD 44.00 # Gr. N-80
256′—8-5/8″ OD 44.00 # Gr. N-80
11,992′—Set at 12,004′

A long string of 5½-inch OD casing was set to 13,998 feet and cemented with 500 sacks of slow set cement. One washdown shoe and two float collars were used. The following is a schedule of 5½-inch pipe used:

Top of Hole:
1,651′—5-1/2″ OD 20# Gr. N-80
4,664′—5-1/2″ OD 17# Gr. N-80
7,673′—5-1/2″ OD 20# Gr. N-80
13,988′—Set at 13,998′

Due to high temperatures anticipated at completion depth, there was a possibility of the powder charge in the perforating gun being ignited. A test run was made with a dummy gun having four chambers loaded. Two of these chambers were loaded with regular powder and two were loaded with high-temperature powder. No bullets were used.

This dummy gun was run in the hole, lowered and raised between 10,000 feet and bottom for 1¼ hours. This prolonged period in the hole was to give the powder a good chance to come up to heat which would discharge it. The gun was pulled from the hole, and it was found that the temperature (recorded at 242° F.) had no effect on either type of powder. Ignition temperature of the regular powder was 300° F. To remain well on the safe side, the high-temperature powder was used when the perforations were made.

This is the third well drilled on this prospect and in comparing it to the other two wells drilled in the same structure, a very noticeable decrease in drilling time is noted. The Barataria Bay 1, first to be drilled on the structure, required 216 calendar days to drill to 14,490 feet, total depth. Barataria Bay 2 required 193 days to drill to the same depth. And the L.B.L.D. No. 1 required only 165½ calendar days to drill to 14,490 feet. This is 50½ days faster than the first well and 27½ days faster than the second.

It is believed that the increase in rate of drilling was primarily due to the addition of drill collars over and above the amount used on the first two wells. Also, the rate of rotation, which varied from 45 to 60 revolutions per minute, as well as the larger hole below the protection string, contributed to this increase.

At the time drilling ceased, the hole was in excellent mechanical condition, and it was not necessary to stop drilling due to condition of the hole. A total of 3519 feet of open hole was carried below the protection string, the greatest amount of open hole ever carried in the Houma District.

Production perforations were made in the Lafourche Basin Levee sand No. 1, in the Miocene, the same geological age as the formation from which Shell's Smith State Unit 1, Well 3, produces. The structure is a deep-seated, piercement-type dome. At present, the gas from the record producing well is being used for further development of the field. Ultimate disposition of the gas produced from the Queen Bess Island area will be determined after the production limits of the field have been defined and the estimated volume of gas is known.

NEW METHODS NEEDED TO

Produce More Oil

By RAYMOND D. SHREWSBURY

MODERN FIELD ANALYSES disclose that present day application of conventional production practices has resulted in the removal of only a small portion of the original oil from reservoirs. Present and future petroleum requirements make it imperative that methods be developed that will leave little, if any, oil underground.

DEMANDS for petroleum and its products are increasing at a rapid rate and constitute a challenge to the production engineer. If this country is to meet domestic requirements it must produce more oil. Although major oil fields may be found in the future,—fields in the magnitude of 100 million barrels or more—the industry cannot afford to depend on "probable" discoveries to bolster its reserves position.

On the other hand, an estimated 100 billion barrels of unrecovered crude still remain in the stripped and abandoned fields of the country. The problem of recovering more of this lost oil forms the subject of this article. Concerted action by petroleum engineers and abandonment of some obsolete ideas should make much of this lost oil available and in less time than it would take to develop comparable reserves through wildcatting alone.

Popular Misconceptions

Among misconceptions proposed for correction are (1), that there are any inherently impervious sedimentary rocks; (2) that the flow of underground fluids form a porous formation is proportional to the differential pressures.

The theories to be presented are based principally upon field observation. They do not require elaborate formulae for their presentation and if they can be substantiated through research and investigation, the way may be open to greatly increased oil production from new fields as well as from old.

A study of Figures 1 and 2 reveals that before real oil production efficiency can be achieved, methods radically different from those practiced in the past must be developed.

Figure 1 is a regular field decline curve reproduced from a government publication[1] recommending waterflooding for the Hogshooter field in Northeastern Oklahoma, a field taken as typical of many abandoned or nearly abandoned fields in the country. Alone, such a curve gives an erroneous impression because it shows only the rate of production and fails to indicate the relatively small amount of oil actually produced in comparison with the actual oil in place. A considerable increase in eventual recovery is indicated to have resulted from the application of vacuum, secondary drilling and repressuring. When the cumulative production is compared with the oil remaining in the formation as shown in Figure 2 (prepared from the same data), the results obtained by these methods become insignificant.

It is not intended to imply that Figure 1 represents any effort at concealment. Rather, such curves have been used for years as a means of estimating future recovery. It is only recently, through analysis of fields characteristics and cores, that it has been possible to estimate the actual amount of oil in a reservoir. From investigations already made it appears that at least 100 billion barrels, or twice world oil production to date, has been left in the older American oil fields.

Reappraisal Urged

In view of the inefficiency of old production methods it is remarkable that it has been possible to supply the demand until now. If new fields are not to go the way of their predecessors new ways must be developed for getting oil out of the ground. This calls for reappraisal of all the factors having to do with the origin, migration and entrapment of petroleum hydrocarbons. The first of these seems to have attracted plenty of attention but the other two are of far more immediate importance.

So thoroughly established in oil field terminology has the term "impervious cap rock" become that it is invariably used without qualification. Such use becomes even more indefensible when it is considered that in all the various oil fields it probably has been applied to every known type of sedimentary rock, whereas these beds are universally permeable. Even marble has recently been found sufficiently absorbent to permit its being marked with oil. It may be claimed that only relative impermeability is meant. But in speaking of the origin, segregation, and entrapment of oil, time can be considered only in terms of geologic ages. With time of such order, degrees of permeability, (particularly in the thin crust of the earth) become meaningless and it is necessary to account otherwise for the very obvious fact that petroleum *is* retained in reservoirs.

It is a generally accepted principle that whatever pore spaces exist below the water table are necessarily filled with water, oil, or gas. Because the sedimentary rocks in which these substances occur are porous and permeable it follows that the fluids themselves must possess a definite faculty for remaining *in situ*.

It is proposed here to call attention to the capacity of oil and/or water to confine themselves.

In mining it is practically axiomatic that to let a mine fill with water is to lose it. Quite often the water encountered as digging proceeds can be readily handled. But if for any reason a head of water is allowed to form it becomes difficult or even impossible again to empty the mine. It is often possible to

[1] A Study of Secondary Recovery Possibilities of the Hogshooter Field, Washington County, Oklahoma, by I. W. Fox, C. H. Thigpen, R. L. Ginter and G. P. Alden, Conservation Branch, Oil & Gas Division, U. S. Geological Survey. Report No. 108484.

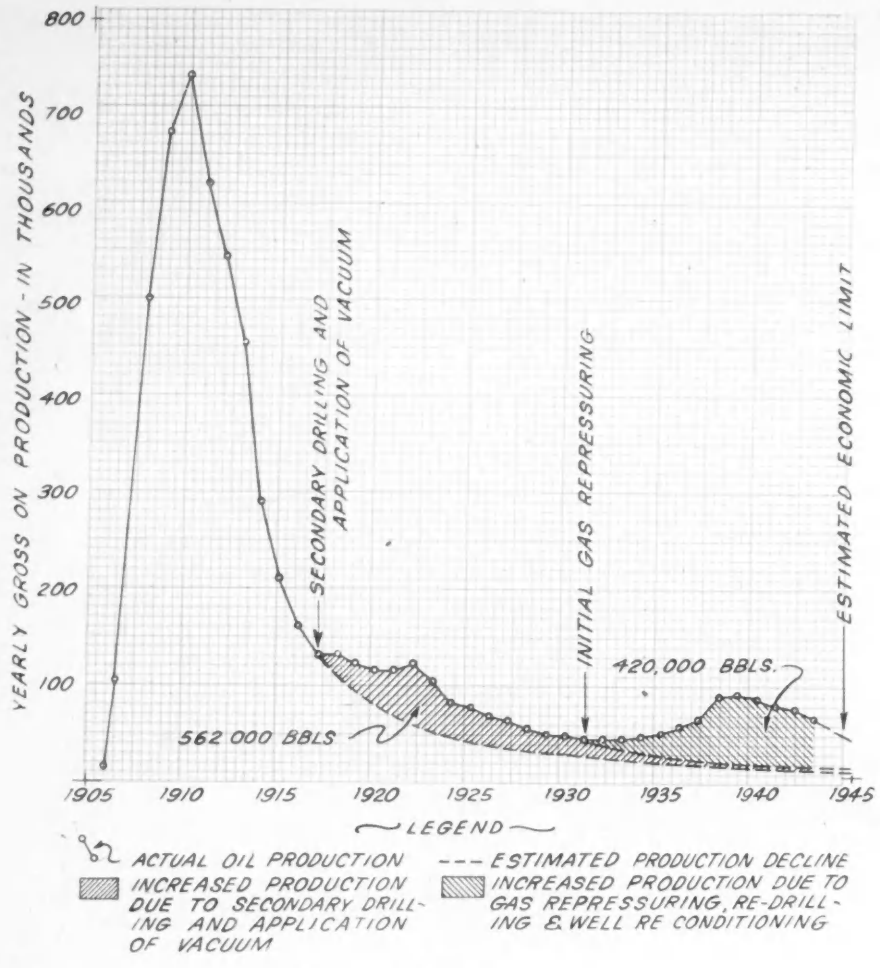


FIGURE 1

penetrate considerable thickness of porous and saturated rock by the simple expedient of adapting the amount of new face exposed to the pumping capacity. As new areas are opened older ones seal themselves.

Cabletool drillers have always taken advantage of this phenomenon. Whenever a water-bearing formation is encountered every effort is made to "carry" the water by bailing. If any drilling progress can be made the hole may be expected to dry up. It is not uncommon in such cases for the flow of water to completely cease within a short time. Even though this situation is encountered during the drilling of every well in a field, the drillers speak, in each case, of having "exhausted the water." When pressed for a more reasonable explanation they are likely to claim that the slapping of the drilling cable against the wall "mudded off" the formation. This explanation merits no consideration. Again, care must be exercised to avoid over-producing irrigation wells or they will go dry.

It is fortunate that water does possess this propensity else it would all escape at the greatest depth to which any stream in the vicinity could cut a porous formation. That this does not occur may be observed in mountainous areas. Erosion may cut completely through a saturated formation without releasing the water. During the war, attempts were made to supply an Army tir field in the Texas Panhandle with water from a minimum number of large-diameter wells equipped with high volume pumps. The initial flow usually appeared adequate but after a few weeks each succeeding well failed.

In view of the examples cited it seems probable that wherever any considerable flow of water to the surface occurs there is a large fissure or opening extending to the source bed and the pressure drop between the porous formation and such opening is low.

In other words, over an extended period of time the flow of fluids from fine grain porous media is inversely proportional to the pressure gradient.

Effect of Minerals and Gases

The above statement is to be considered as a general proposition. Individual cases will vary in accordance with the amounts of dissolved minerals and gases. That all natural waters do contain these is generally conceded. One thinks of a natural spring as "bubbling" out of the ground. If the water is drinkable the bubbling agent is very likely to be carbon dioxide CO_2 dissolved in water forms carbonic acid in which many bases are more or less soluable. Thus a drastic reduction in pressure will lower the acidity of the water and result in rapid precipitation of carbonates in the pore spaces near the face of the water-bearing formation. Secondary deposition is inevitable and the process may be considered a demonstration of the earth's ability to heal its wounds.

It is not uncommon, where an oil-bearing formation outcrops at the surface, for it to be plugged with bituminous material to the extent that commercial production may be found down the slopes. In such cases the oil is progressively higher in gravity away from the outcrop. Much the same condition will occur near the well bore when an oil well is overproduced. To attempt to drain an oil sand by gravity is to set up conditions which tend to seal the formation and any production that is obtained is through seepage only. Thus a field may reach what is now considered the abandonment stage with the producing formation still completely oil saturated. What oil was produced may be thought of as surplus or, if such a condition is conceivable, originally there was supersaturation. The oil produced by "drainage" will always be a minor portion of the total volume in the formation.

Paraffin deposition in the bottom of a well is always evidence of incorrect production methods. It may be claimed that paraffin problems have been with us always and most of them have been solved. Even if this were true there would still remain connate water to consider. It has now been determined that few, if any, oil pays are entirely free of residual water and this water is usually highly charged with minerals. At least some of this fluid inevitably will be produced with the oil and if pressure conditions are right, deposition will occur. This would account for injections of hot water or acid being effective in many cases where paraffin solvents fail.

Even "dry" gas wells, when produced at an excessive rate, have been observed to decrease more than the reduction in reservoir pressure would seem to account for.

Vacuum, applied to oil wells, may appear to benefit production for a short time but the net result in all cases is probably negative since this is a long established refinery practice for removing light oil fractions, or depositing heavy ones.

It may be stated that in all cases where gas comes out of solution as a fluid passes from a close-grained forma-

tion into a well bore, deposition will occur whether the fluid be oil, water, or a combination. It is quite possible that many wells produce oil only because they also make enough water to maintain back-pressure against the pay zone.

That the principle involved applies even where there is an active natural water drive is well demonstrated in the Rocky Mountain area. Cases are known of flowing oil wells in that region (having normal bottom hole pressures for the depth) being converted to the status of dry holes simply by swabbing them down until the solution gas came out of the oil within the formation.

It is contended that each oil field and even each individual well presents its own special production problems. If it can be established that the recovery methods used are fundamentally wrong it can better be said that there is a wide range of tolerance to abuse.

More "efficient" pumping equipment has steadily been developed but it is doubtful if such improvement has resulted in increased eventual recovery from any field. On the contrary it often seems that those leases with the more antiquated equipment exhibit better decline characteristics. It is not unusual for a property that has "held up" over a period of years, when reconditioned and re-equipped, to produce at an increased rate temporarily and go "dry." The phenomenon is sufficiently well known to account for the rather general attitude of "let well enough alone" and constitutes tacit admission that the principles of getting the load off to let in more oil is basically unsound to the extent of defeating its purpose.

When it is considered that miners use the same method to restrict flow that oil men do to encourage it, it is realized that the latter guessed wrong simply because they could not see what was happening.

Bright Side

The bright side of the picture is that all but a minor portion of the oil that has been discovered is still safe underground and its location is known. That really scientific methods for its recovery will be developed may be assumed. The success of pressure maintenance wherever it has been applied is gratifying. Water flooding offers promise but it is to be remembered that this is not a new development. Accidentally and otherwise, flooding has been practiced since the early days of the business and yet cores from "flooded-out" areas still show a high degree of oil saturation. If these two methods, or rather adaptations of a single method, are to leave a considerable quantity of petroleum to be recovered by some still more advanced operation, it would appear logical to apply the final method first and avoid the intermediate steps.

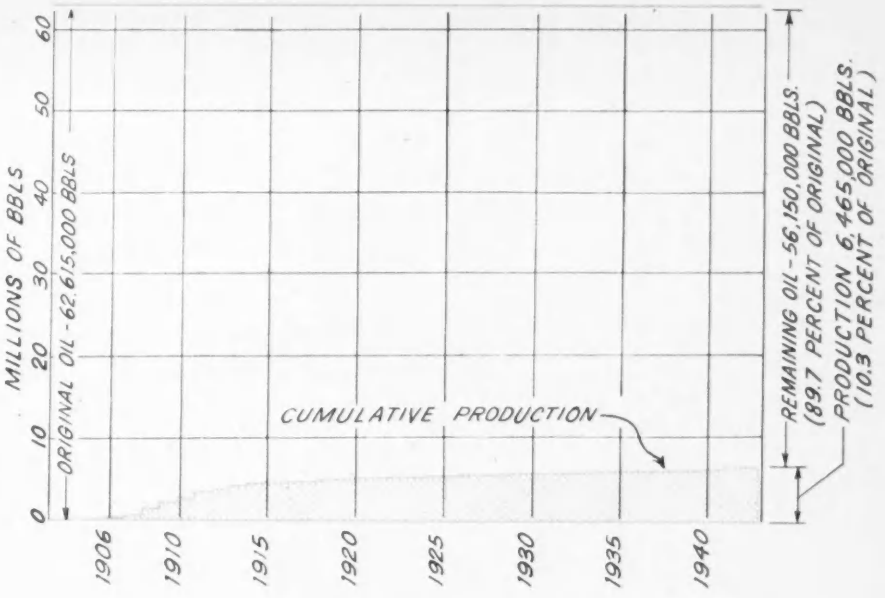


Figure 2. Cumulative production in the Hogshooter field, Oklahoma, compared with residual oil in the reservoir.

It is granted that to propose to remove all the oil, or even a major portion, from a reservoir borders upon the fantastic, but it is submitted that every reservoir originally was filled with water. If the natural principles involved can be determined it is not unreasonable to expect to displace all of the petroleum to the surface with more water.

In any discussion of petroleum hydrocarbons, chemistry and geology hardly can be avoided. In the preceding, the writer has attempted to present his conception of how natural underground fluids seal themselves in. If the theory is acceptable it becomes simple to account for the "impervious cap rock" overlying all petroleum reservoirs. The sedimentary formations above the reservoirs, being pervious, allow a certain amount of the oil to escape upward and in doing so a deposition of heavier fractions is left behind to cover over and entrap more oil moving in.

Justification for this conclusion is found in the fact that when drilling in with cable tools the first indication of near approach to the pay zone is a dry, soot-like deposit on the flat surfaces of the bit and stem. Also, when chemical analyses of drill cuttings show a steadily increasing concentration of hydrocarbons with depth it is taken to indicate the probability of a producing well.

Such examination of cuttings also shows a less than normal concentration of free hydrogen in the sediments overlying an oil field. If it is acknowledged that practically all of the materials in, on, or over, the surface of the earth have exuded from the interior, it is quite evident why there is little hydrogen over oil deposits. Because of its affinity for carbon this gas is simply trapped and absorbed.

Therein may lie the answer to obtaining all the hydrocarbons from a trap.

Increasingly large amounts of hydrogen are being used in refinery operations. If the desired reaction can be caused to occur underground, no more of the gas will be required for a given amount of oil than if it is carried out in pressure vessels above ground. It is claimed that a catalyst is necessary for hydrogenation to occur. However, iron oxide is perhaps the most common material used for this purpose and it probably is present in all oil reservoirs. Assuming success for such cracking operations, the lighter fractions could be continually removed so long as they are formed.

Several years ago a Pittsburgh steel company had occasion to operate its coke ovens while the steel mills were idle. Not wishing to waste the coke oven gas (50 percent free hydrogen) it was stored in a depleted oil field. Two years later, when there was occasion to draw upon this storage, the company was gratified to find not only a considerably increased volume but also a heating value nearly 50 percent higher for the gas. Much of it must have been converted to methane through contact with residual oil.

Underground hydrogenation, radioactivity, bacterial action, separately or in combination, give promise of making available a supply of petroleum far in excess of that which may be expected from wildcatting for years to come.

By PARK J. JONES
Consultant

Condensate

PRODUCTION AND CYCLING

Part 4

Invasion Patterns and Factors

THE BASIC data of Part 3 on the unit injection circle and the breakthrough pattern for one well pair are applied in this article. A procedure for estimating an invasion pattern relative to boundaries and interference between wells is derived and illustrated graphically for symmetric and asymmetric conditions in reservoirs. Invasion patterns are used to locate producing and injection wells. The more advantageous locations are those for which the breakthrough invasion factor is greater for a reservoir as a whole. Per-bed and per-well depletion rates also influence condensate recovery at breakthrough of gas and at cycling economic limit. Invasion factors will be connected with depletion rates on a per-bed basis in Part 5 and on a per-well basis in Part 6.

Bounded Breakthrough Area

In terms of the unit injection circle (see Part 3) the breakthrough area for bounded conditions cannot exceed $CN/(N+2)$ where C is some constant and N is the number obtained upon dividing 360 degrees by the degrees allocated to an injection well. The number of breakthrough areas is equal to N the number of injection wells. Hence, the breakthrough area per injection well cannot exceed $C/(N+2)$.

The breakthrough area for 360 degrees per well is C/3. Hence, the breakthrough area B for 360/N degrees per injection well cannot exceed, but can be smaller than, the area defined by

$$B = \frac{3}{N+2} \qquad (1)$$

where B is a fraction of the breakthrough area for 360 degrees per injection well. The B curve in Figure 4-1 is a solution of equation (1). The breakthrough area for 90-degree injection wells cannot exceed 50 percent of the area for 360 degrees. The breakthrough area for 20-degree injection wells cannot exceed 15 percent of the area for 360 degrees.

Reduced Breakthrough Patterns

Figure 4-2 shows some reduced breakthrough patterns. The numbers on the right give the half width of the 360-degree pattern at 10 percent distance intervals. The half width of the 40, 60 and 80 percent patterns is 40, 60 or 80 percent of the half width of the 360-degree pattern. The distance invaded behind the injection well is also 40, 60 or 80 percent of the distance behind the injection well for the 360-degree pattern.

The R curve in Figure 4-1 shows what reduced pattern corresponds to degrees per injection well. For instance, a 68 percent pattern requires 120 degrees per injection well. The breakthrough area for 60 degrees per injection well is given by a 47 percent pattern. The data are for the breakthrough interval. The R curve is obtained by planimetering reduced areas like those in Figure 4-2. The relative planimetered area is then plotted against the angle $360B/(3-2B)$ where B is given by equation (1).

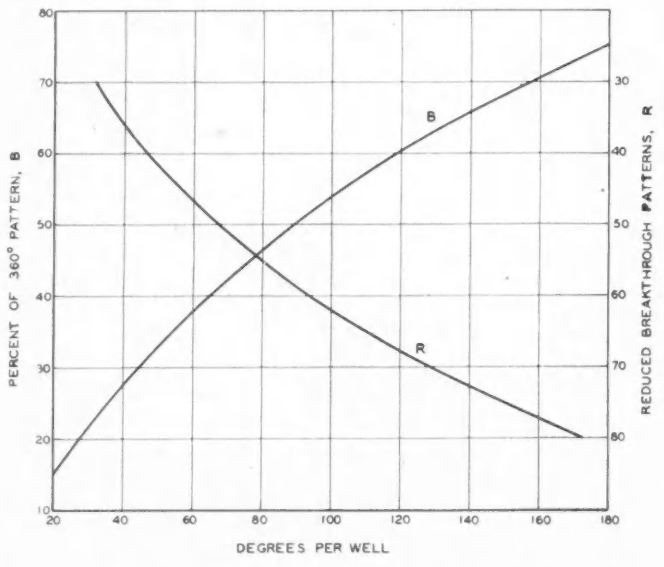


Figure 4-1. The area of bounded breakthrough Patterns B and reduced breakthrough Patterns R in percent of the 360-degree pattern.

Degrees at Injection Well

An injection well cannot maintain the width of an invasion pattern over 70 percent of the distance between a producing well and the injection well. The angle A/2 at the injection well, see Figure 4-3, is determined by either a line of symmetry or a boundary on the line through the 70 percent point.

Other things being equal, lines of symmetry pass through the midpoint between injection wells. Boundaries are either a gas-water contact or limits of production caused by structure or stratigraphy. In-

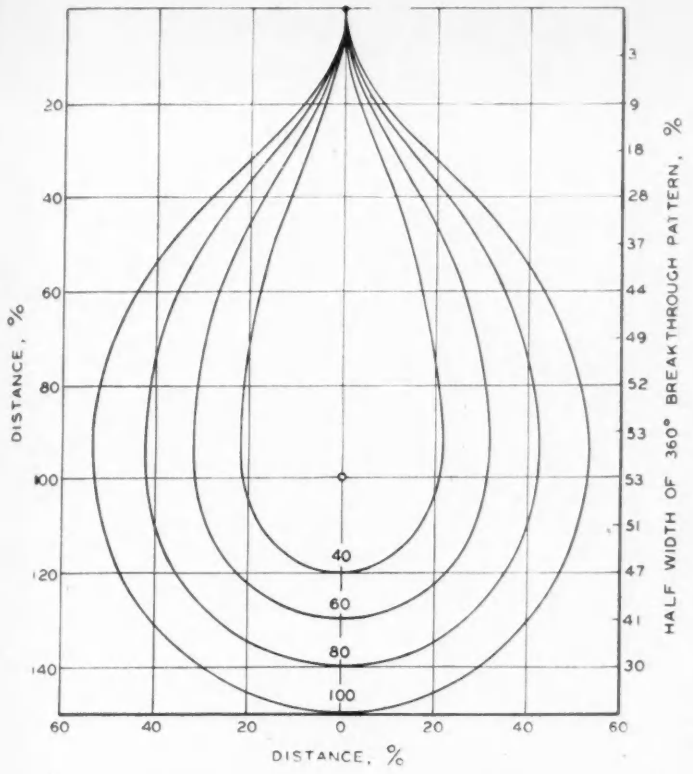


Figure 4-2. Reduced breathrough patterns.

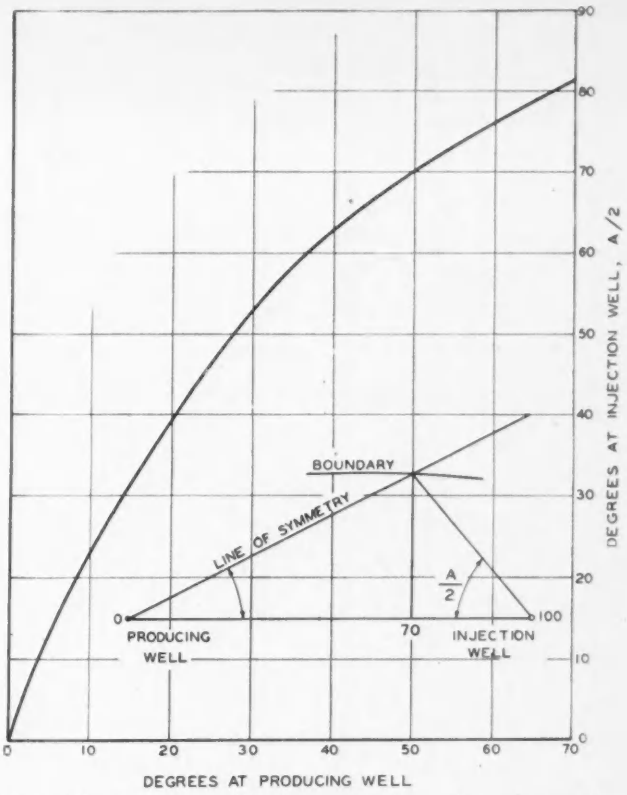


Figure 4-3. Degrees per injection well A/2 vs. lines of symmetry and boundaries.

jected gas does not cross lines of symmetry or impermeable boundaries.

A Radial Reservoir

Consider the radial reservoir mapped out in Figures 4-4 through 6. The reservoir has three pay intervals separated by two impermeable breaks. The three intervals are designated by (a), (b) and (c). Let the top or (c) interval be most permeable, that is, the breakthrough interval. The area invaded by dry gas in the (a) and (b) intervals at breakthrough in the (c) interval is equal to the breakthrough area times the permeability ratio. For instance, when the permeability ratios are ½ and ¼, the invaded area would be 50 and 25 percent respectively of the breakthrough area.

Figure 4-6 shows six producing wells and five injection wells. The latter are located along the water contact on the bottom of pay. Gas injection is into rich gas for the three intervals. The reservoir has 180 degrees. The degrees per producing well is 180/5 or 36. The half angle at a producing well is 18 degrees. From Figure 4-3 the half angle at the injection well is 36 degrees. In the present example, both half angles at the injection well are the same. So there are 72 degrees per injection well.

From Figure 4-1, the reduced breakthrough pattern corresponding to 72 degrees per injection well is 52 percent of the 360-degree pattern. Fifty-two percent of the distances shown in Figure 4-2 gives the breakthrough pattern shown in Figure 4-6.

The area invaded by dry gas in the less permeable intervals at the time gas breaks through in the most permeable interval is proportional to permeability ratios. Let the permeability ratios equal 0.25, 0.50 and 1.0 for the (a), (b) and (c) intervals in the radial reservoir. Figure 4-6 shows the corresponding invasion patterns. The area within the (a) pattern is 25 percent of that within the (c) pattern. The area within the (b) pattern is 50 percent of the breakthrough area. On the basis of uniform per-interval pay thickness, the invaded area and invaded acre-feet of pay at breakthrough would be (0.25 + 0.50 + 1.0)/3 or 58.3 percent of the area and volume that could be invaded if permeability were uniform.

Small Elongated Reservoirs

Figure 4-7 shows an injection pattern for a small elongated reservoir. The reservoir has bottom water and only one pay interval. There are no impermeable breaks within the pay. So the contours on top of pay also indicated pay thickness.

The injection well is located symmetrically with respect to the water contact at the 70 percent points. There are 117 degrees at the injection well.

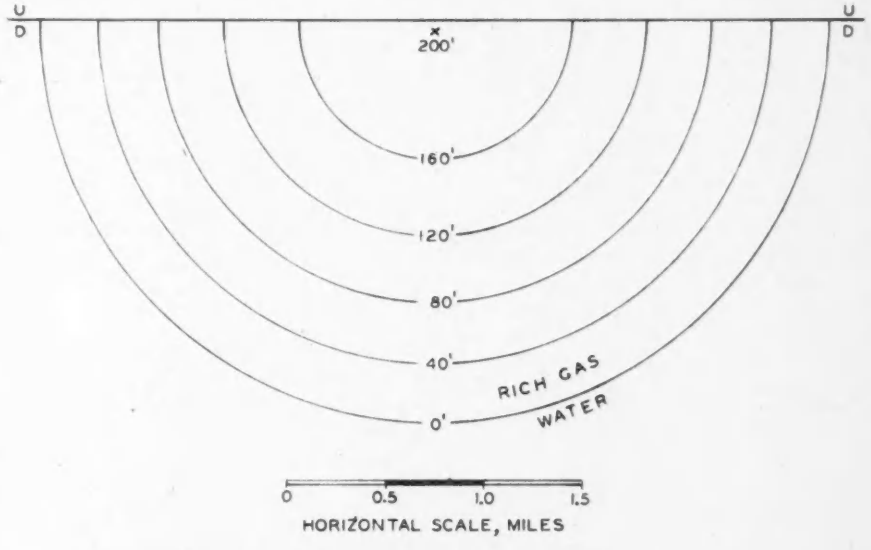
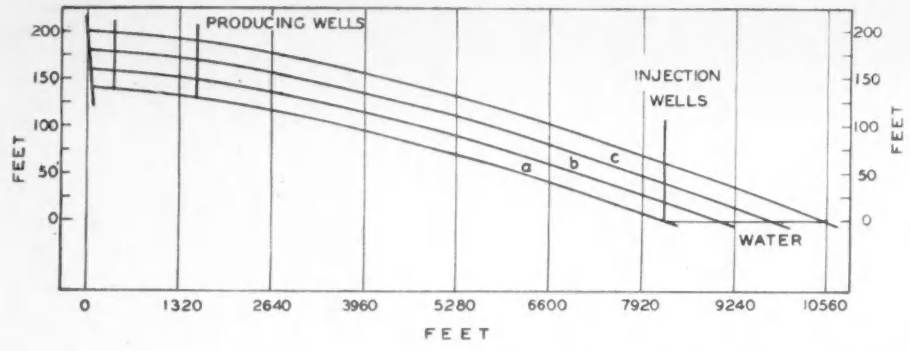
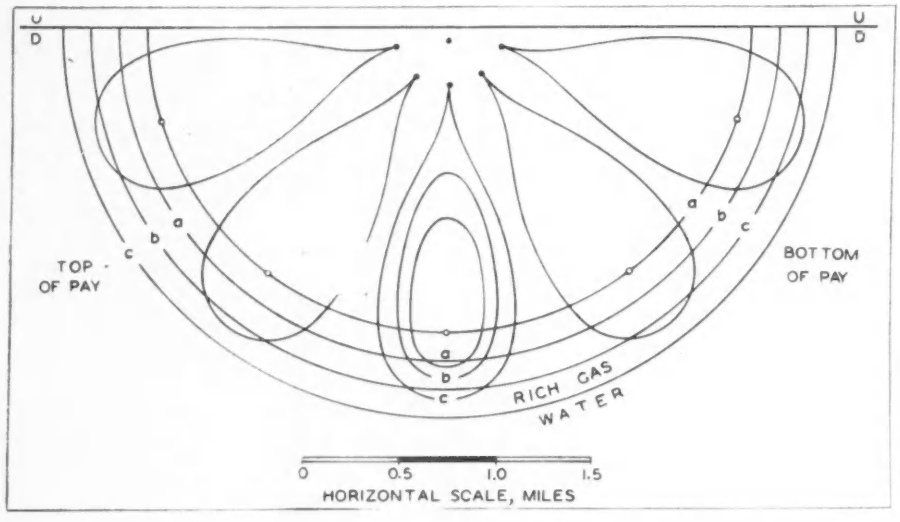
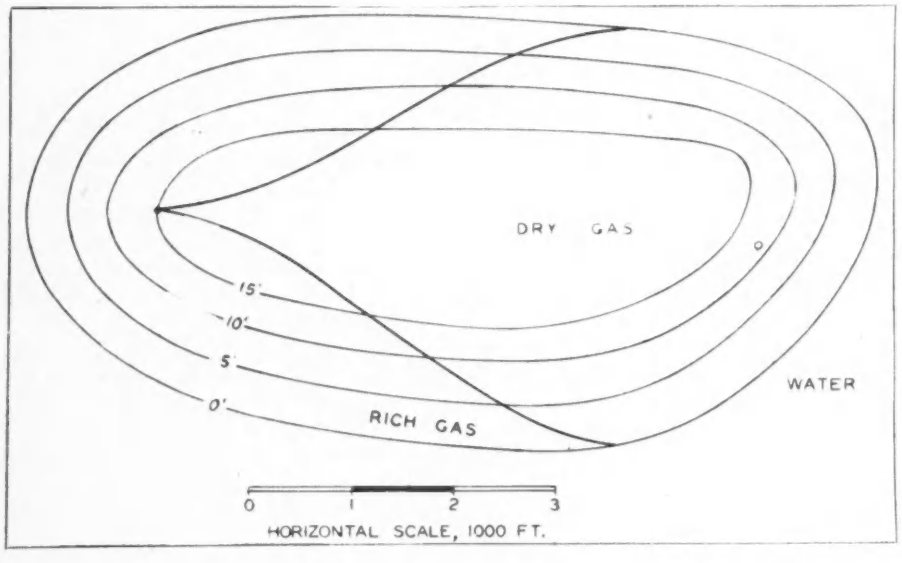
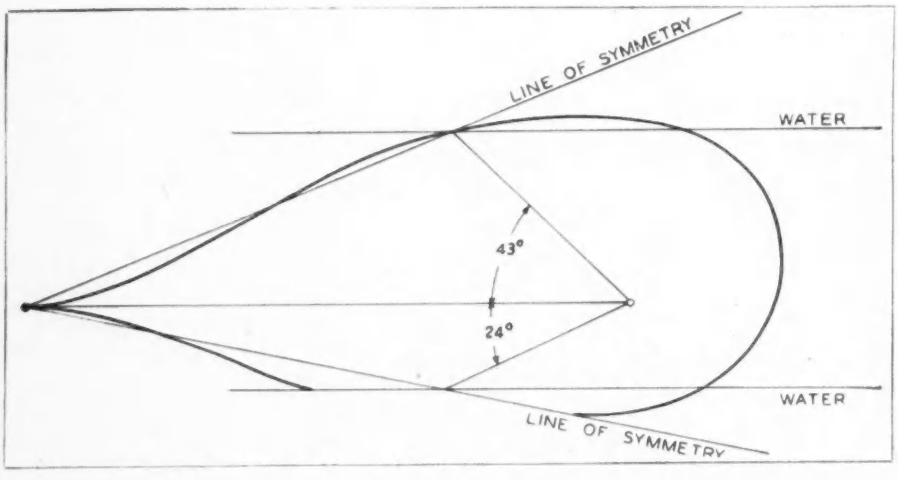


Figure 4-4. Contours on top of pay in a radial reservoir.









The reduced pattern is 67 percent of a 360-degree pattern.

Suppose a producing well were located in the center of the elongated area and an injection well at each end. The acre-feet of pay invaded at breakthrough would be less than the invaded acre-feet shown in Figure 4-7. More generally, it is advantageous to locate a well pair at opposite ends of small elongated reservoirs. The acre-feet of pay invaded at breakthrough, and at economic limit for cycling, is greater for one than for two injection wells.

Asymmetric Patterns

The location of an injection well may be asymmetric with respect to a water contact or the lines of symmetry between injection wells. Figure 4-8 is an example. The half angles are 24 and 43 degrees respectively for either the water contrasts or the lines of symmetry. Twice 43 is 86 degrees and the corresponding reduced pattern is 57 per cent. Twice 24 is 48 and the corresponding reduced pattern is 41 percent of a 360-degree pattern. The pattern in Figure 4-8 is one-half of the 57, and one-half of the 41, percent reduced patterns. Two sets of boundaries are indicated in lieu of drawing two sketches. An invasion pattern does not extend arcoss a boundary. Asymmetry arises from location of wells, disproportional injection rates or disproportional producing rates as between wells having uniform acre-feet of pay or as between wells having uniform producing or injection rates but nonuniform acre-feet of pay per well pair.

Reference

[1] Swearingen, Judson S., *The Oil Weekly*, December 25, 1939

Top: **Figure 4-5. N-S section through a radial reservoir.**

Top center: **Figure 4-6. Invaded area for intervals (a) and (b) at breakthrough in the (c) interval; permeability ratio is ¼, ½ and 1.0 for intervals (a), (b) and (c), respectively**

Lower center: **Figure 4-7. Invasion pattern for one injection well in an elongated reservoir; reservoir has bottom water; contours indicate structure and pay thickness.**

Below: **Figure 4-8. An asymmetric breakthrough pattern.**

Bacterial Release of Oil

FROM OIL-BEARING MATERIALS

Part 2

By DR. CLAUDE E. ZoBELL

THE release of oil from plant or animal tissues is another function attributed to bacteria. Most plants and a good many animals produce or store hydrocarbons in their tissues to some extent. Not infrequently such hydrocarbons may be so intimately bound by organic matrix that the hydrocarbon is not freed until the organic matrix is decomposed. The selective degradation of such organic matrices by bacteria may contribute to the liberation and accumulation of petroleum hydrocarbons, particularly in recently deposited sediments. Of course, whether the hydrocarbons will also be destroyed by bacteria will depend upon the types of bacteria present and the environmental conditions.[79]

It is a fairly common experience to note an increase in the amount of nonsaponifiable oily material that can be extracted with ether or other solvents from algae during the decomposition of the latter. This is partly attributable to the synthesis of hydrocarbons by bacteria, but probably primarily attributable to the liberation of hydrocarbons from decomposed algal tissues. The storage of the sludge of diatoms was found by Clarke and Mazur[19] to be accompanied by a fall in the free fatty acid content and a rise in hydrocarbons. Storage of such material did not always result in an increase in hydrocarbons, presumably due to differences in microbial flora. Depending upon the microbial species present and the prevailing environmental conditions, bacteria or fungi may liberate oil by the selective decomposition of the organic matrix, they may destroy oil, or they may synthesize oil.

The bacterial synthesis of paraffinic hydrocarbons ranging from C_{10} to C_{25} has been reported by Jankowski and ZoBell[32] and confirmed by more recent observations. The hydrocarbons synthesized by bacteria constitute a part of the cell substance of the bacteria and can be extracted only after the death and decomposition of the bacteria.

Thiessen[68] has expressed the view that spores of various plants, remains of which are found in oil shales, consist largely of oils and waxes which are liberated only upon the decomposition of the spores. According to Stadnikow and Weizmann,[57] certain species of algae contain considerable amounts of nonsaponifiable oil and waxy material. That long-chain hydrocarbons ranging from $C_{16}H_{34}$ to $C_{27}H_{76}$ occur in the leaves and bark of many species of plants is documented by the literature summarized by Seyer,[49] Chibnall and Piper,[16] and Sanders.[47] Heptane, pentadecane, hexadecane, eicosane, and higher paraffinic hydrocarbons are common constituents of plant and insect tissues, according to Chibnall et al.[17] Sanders[47] has presented evidence that unicellular algae have contributed considerable amounts of waxy and oily substances to petroleum, as judged by decay-resistant remains of such organisms.

An enzyme preparation from microorganisms for deproteinizing rubber hydrocarbons has been described by Wallerstein.[69] Spence[66] has patented a biological process for the decomposition of guayule to promote the release of rubber hydrocarbons. The decomposition of guayule resins by microorganisms for the purpose of producing improved rubber hydrocarbons has been studied by Allen et al.[3] In a similar way, bacteria and allied microorganisms may have contributed to the liberation of petroleum hydrocarbons from the organic matrix of plant and animal tissues.

Types of Bacteria Which Release Oil

From the multiple ways in which bacteria release oil from various kinds of sedimentary material, it should be apparent that many different bacterial species may contribute to the process. Particularly is this true in recently deposited sediments that are relatively rich in the organic remains of plants and animals, tissues of which may carry hydrocarbons. ZoBell[77] has listed nearly a hundred different species of bacteria found in marine bottom deposits, where they appear to be active in the decomposition of organic matter.

An average of 160 million bacteria per gram of mud from the sea floor near Andros Island in the West Indies was reported by Drew.[21] Sediments from the Channel Island region off the coast of southern California were found by ZoBell and Anderson[83] to contain several million viable bacteria per gram (wet basis). A progressive decrease in the bacterial population in bottom deposits with depth has been noted wherever profile series were examined.[35, 44, 45, 65]

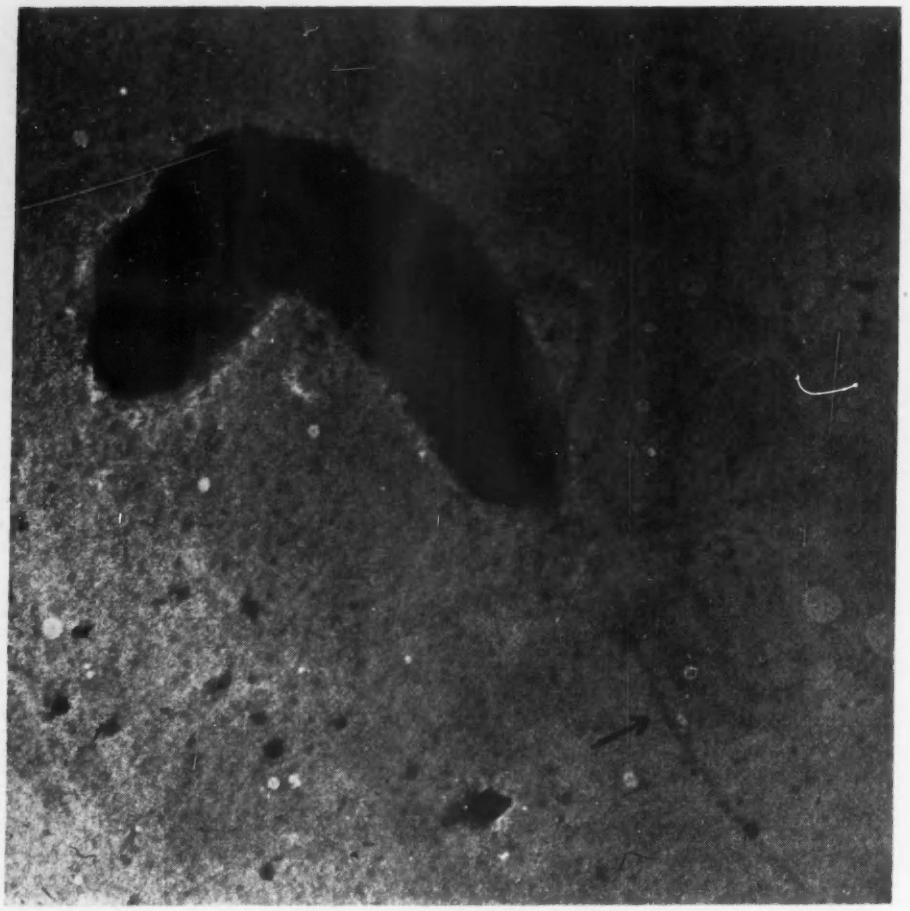
Below a depth of 10 to 20 feet, strict anaerobes predominate, and a good many of the bacteria appear to be sulphate reducers, methane producers, or other physiological types having specialized hydrogen-acceptor requirements. For example, sulfate serves as the hydrogen acceptor or as the source of oxygen for sulfate-reducing bacteria, and carbon dioxide or bicarbonate serves as the hydrogen acceptor for methane-producing bacteria:

$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$

Hydrogen for sulfate-reducing, methane-producing, and similar anaerobic bacteria may come from the fermentation of organic matter,[83] the radioactivation of hydrogen-containing compounds,[80, 81] or from other reactions.[28, 29, 81]

The investigations to date indicate that sulfate-reducing bacteria are the most versatile and most widely distributed oil-releasing microorganisms. Not only can they degrade many kinds of organic matter that may contain oil but certain sulfate reducers also decompose gypsum, dissolve carbonates, produce carbon dioxide, form wetting agents, and attach themselves to the solid surfaces, thereby releasing or crowding off oil. Their versatility, together with their common occurrence in sediments and their ability to grow under a wide variety of environmental conditions, has attracted attention to sulfate reducers in studies on the bacterial release of oil.

Recent investigation indicates that methane-producing and hydrogen-liberating bacteria also contribute to the release and movement of oil in labora-



Electron photomicrograph of a single cell of a sulfate-reducing bacterium magnified 45,000×. The arrow directs attention to the flagellum, a long, slender, whip-like appendage by which the cell propels itself through fluid medium.

tory experiments. Further studies may reveal that other physiological types of bacteria are equally important.

Characteristics of Sulfate Reducers

Sulfate-reducing bacteria are single-celled microorganisms ranging in size from 0.5 to 1.0 micron in width by 1.0 to 5.5 micron in length. A micron is approximately 1/25,000 inch). They generally occur singly, although, in rapidly multiplying cultures, they may appear in pairs or short chains of cells loosely attached end to end. Young cells of all observed species are actively motile by means of one or more polar flagella. Older cells are sedentary and often appear black owing to the presence of ferrous sulfide on or in their cells.

Like other true bacteria, sulfate-reducers multiply by transverse fission, the parent cell splitting athwart the long axis into two daughter cells every hour or so. The rate of multiplication depends upon the temperature and other environmental conditions. When conditions are not favorable for their multiplication, they may remain dormant for many months, years, or possibly for centuries. Some sulfate reducers form endospores which are extremely resistant to high temperatures and other adverse conditions.

Sulfate reducers generally appear as slightly curved rods, although pleomorphic forms are common. Differences in morphology, coupled with the difficulty in obtaining absolutely pure cultures, has led to considerable confusion in naming sulfate reducers. (A pure culture is one which contains only one kind or species of bacteria as opposed to a mixed culture which contains two or more kinds of species.)

Depending upon which morphological form predominated in their cultures, early workers applied the generic terms *Bacterium, Bacillus, Spirillum, Vibrio,* etc., to sulfate reducers. The first two names are description of straight rods. *Spirillum* is properly applied only to spiral-shaped bacteria having five to twenty flagella, while *Vibrio* is the accepted generic name for curved or comma-shaped bacteria having one or more polar flagella. It is now generally agreed that *Vibrio* is the proper designation for sulfate reducers. The suffix *Desulfo* has been added to indicate curved or comma-shaped bacteria which remove sulfur, thus giving the generic name *Desulfovibrio.*

Starkey[58] has applied the name *Sporovibrio* to curved or comma-shaped sulfate reducers which form spores. Since spore formation does not appear to be a common characteristic of sulfate-reducing bacteria, *Desulfovibrio* may be a more apt generic designation.

There probably are several species of sulfate reducers, but only a few have been described. *Desulfovibrio desulfuricans* differs from *Desulfovibrio aestuarii* primarily in that the former grows best in fresh-water media and fails to develop in sea water upon initial isolation. *D. aestuarii* has the opposite characteristics, although there are other distinctive features. *D. rubentschickii* resembles *D. desulfuricans* morphologically and culturally, differing chiefly in its ability to utilize propionic, butyric, and other fatty acids. *D. thermodesulfuricans* was described as a species having an optimum temperature for growth of 55° C., but since other species can be acclimatized to grow at 55° C. or even higher, this is not a valid species distinction. Stephenson and Stickland[62] described, but did not name, a variety or species of *Desulfovibrio* (Strain 182) which differed from others in its ability to oxidize molecular hydrogen as an energy source:

$$H_2SO_4 + 4H_2 \rightarrow H_2S + 4H_2O$$

Sulfate reducers which utilize molecular hydrogen have been observed by Starkey and Wight,[61,73] Pont,[43] and others.[61]

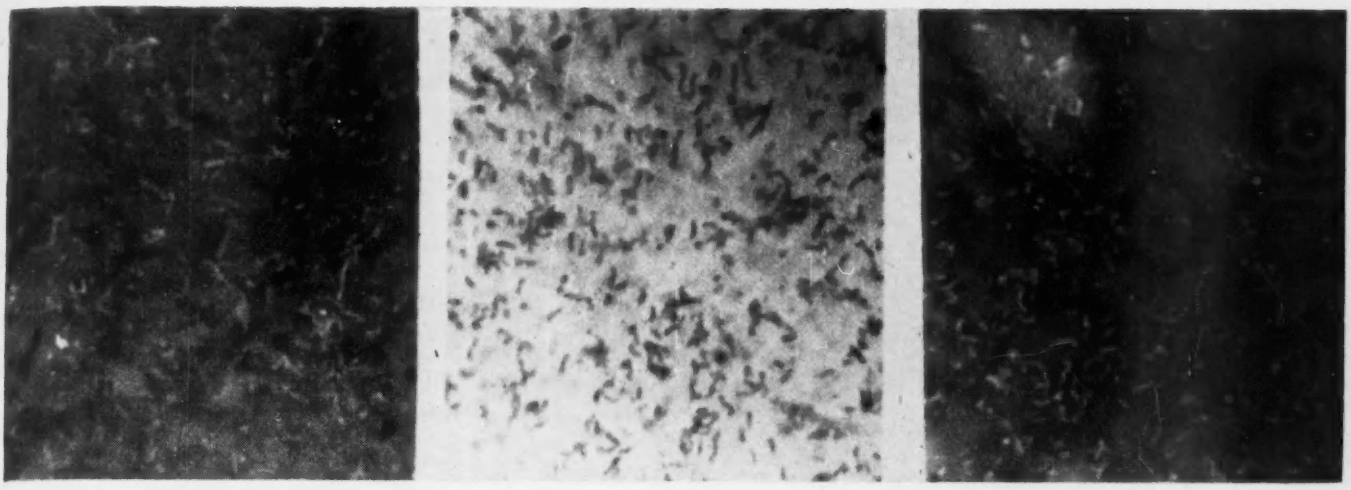
ZoBell[80] named *Desulfovibrio hydrocarbonoclasticus* as a sulfate reducer which attacks petroleum hydrocarbons, the suffix *clasticus* coming from the Greek root *Klastos* meaning to break or to take apart. The prefix *halo,* a Greek combining form meaning salt, has been added to certain varieties which tolerate salt concentrations ranging from 100,000 to 300,000 parts per million. Thus *Desulfovibrio halohydrocarbonoclasticus* is a comma-shaped, sulfate-reducing organism which "breaks" hydrocarbons at relatively high salinities. Cultures of *D. hydrocarbonoclasticus,* isolated from various sources, grow readily in salt solutions ranging roughly from 5,000 to 125,000 parts per million.

The most effective oil-releasing cultures of *Desulfovibrio* were isolated from cores of limestone-sulfur-anhydrite formation taken from a depth of approximately 1530 feet from wells of the Freeport Sulfur Company at Grand Ecaille, La. Cores of the material were provided through the courtesy of G. M. Knebel of the Standard Oil Company of New Jersey. Other effective oil-releasing cultures were taken from marine muds off the coast of southern California.

Additional information and literature on the characteristics of sulfate-reducing bacteria have been catalogued by Baars,[4] Bunker,[13] Rittenberg,[60] Starkey,[58] and Tausson.[64, 66]

Propagation of Sulfate Reducers

Sulfate reducers are strict anaerobes. They grow best in the absence of light. Both *Desulfovibrio hydrocarbonoclasticus*



Sulfate-reducing bacteria photographed with an ordinary optical microscope (final magnification 620×).

and *D. halohydrocarbonoclasticus* are capable of growing in mineral salts solutions enriched with crude oil. Presumably, impurities in crude oil provide the nitrogen requirements of the bacteria. They preferentially attack certain nitrogenous and waxy constituents of crude oil, although their ability to assimilate pure hydrocarbons ranging from decane, $C_{10}H_{22}$, to dotriacontane, $C_{32}H_{66}$, has been demonstrated.[39, 64]

Cultures may be propagated in glass-stoppered bottles or other closed containers from which atmospheric oxygen can be excluded. A low redox potential,[78] E_h —0.05 to —0.35 volt, favors the multiplication of sulfate reducers. Nutrient media can be rendered reducing by the addition of 0.02 percent sodium sulfide, $Na_2S.9H_2O$, or 0.01 percent either ascorbic acid, $C_6H_8O_6$, or sodium formaldehyde sulfoxylate, $NaHSO_2.HCHO.2H_2O$.

After *Desulfovibrio* species start to grow, they create reducing conditions by producing hydrogen sulfide. Some varieties produce the equivalent of 500 to 1500 parts per million of hydrogen sulfide. Either sulfate, thiosulfate, or sulfite, seems to be essential for the growth of sulfate reducers. Sulfite is reduced more readily than sulfate.

The following medium has proved to be quite satisfactory for the growth of sulfate reducers:

Sea water	1000.0 ml.
Potassium phosphate, K_2HPO_4	0.2 gm.
Magnesium sulfate, $MgSO_4.7H_2O$	0.2 gm.
Sodium sulfate, Na_2SO_4	1.0 gm.
Sodium sulfite, Na_2SO_3	0.2 gm.
Calcium carbonate, $CaCO_3$	0.2 gm.
Ammonium chloride, NH_4Cl	0.1 gm.
Ascorbic acid, $C_6H_8O_6$	0.1 gm.
Sodium lactate, $NaC_3H_5O_3$	3.0 gm.

The reaction of the medium is adjusted to pH 7.0 to 7.5 by the addition of one-normal sodium hydroxide or hydrochloric acid as required. Sodium sulfide or sodium formaldehyde sulfoxylate may be substituted for the ascorbic acid. A variety of organic compounds or petroleum hydrocarbons can be substituted for the sodium lactate for the propagation of certain varieties of *Desulfovibrio*. All sulfate reducers do not attack hydrocarbons. For the cultivation of fresh-water strains, sea water can be diluted with distilled or tap water. For the cultivation of halophilic or salt-loving strains, sodium chloride can be added to give the desired osmotic pressure. The addition of 0.01 percent ferrous sulfate, $FeSO_4.6H_2O$, serves as a useful indicator of sulfide production.

Activity in Oil Well Brines

A good many oil-well brines tested have been found to provide all of the essentials for the growth of certain sulfate-reducing bacteria. Maliyantz,[36] observed that a variety of Russian crude oils was attacked by *Desulfovibrio aestuarii* in oil-well brines with the formation of acids and the reduction of sulfate to hydrogen sulfide. The organic acid content of the medium was increased from an initial value of 1.070 grams per liter to as high as 2.191 grams per liter. Reinfeld[43] also observed the formation of acids by sulfate-reducing bacteria in gusher oil and its accompanying water.

Further observations on the reduction of sulfates by *Desulfovibrio* species, which oxidizes petroleum hydrocarbons to organic acids, have been made by Tausson and Aleshina,[64] Tausson and Vesselov,[66] Schneegans,[48] and Novelli and ZoBell.[39]

Part of the plugging action of oil-well brines being injected into Woodbine sands in the East Texas field was attributed by Morris[37] to the growth of sulfate-reducing bacteria in the brines. Alcorn[1] also reported the growth of sulfate reducers in salt-water disposal injection systems. According to Plumer and Walling,[40] the growth of sulfate-reducing bacteria in East Texas oil field waters was stimulated by the presence of ferrous sulfide.

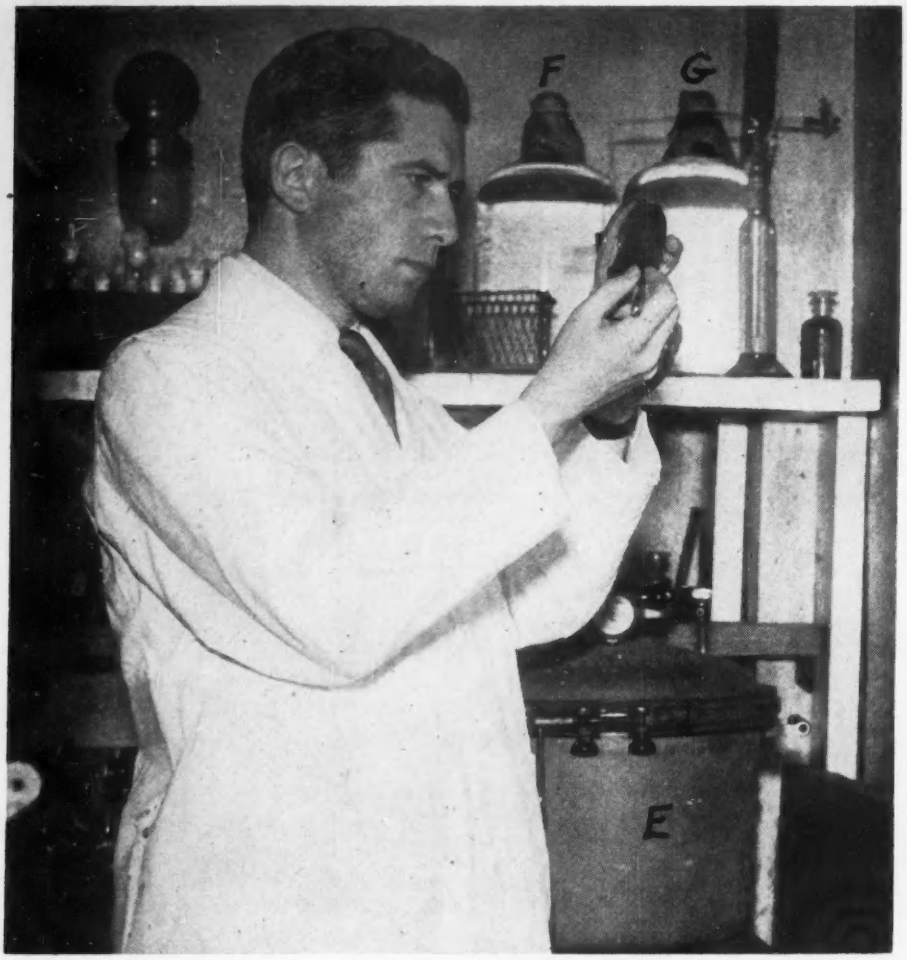
The following amounts of germicides in 2½ liters of oil field brine were required to inhibit the growth of sulfate reducers:[40]

Phenol	2.5 gm.
Lysol	2.5 ml.
Monochlorobutane	3.0 ml.
Trichlorobutane	3.0 ml.
Creosote	7.5 ml.
Cresol	1.0 ml.
Formaldehyde	0.1 ml.

The occurrence of sulfate reducers in oil-well brines is well documented.[9, 10, 24, 25, 26, 81] Whether the bacteria found in reservoir fluids are species indigenous to the oil-bearing formations is problematical, because the bacteria might have been introduced at the time or after the wells were drilled, but the continued abundance of sulfate reducers in certain produced fluids proves that they grow in oil-well brines *in situ*. It may be especially significant that sulfate reducers have been found in less than one-fourth of the samples of reservoir fluids examined for their presence.

Sulfate reducers were detected in only 12 of 33 samples of produced water collected from separation tanks in the Pennsylvania Grade Crude Oil Association area. The numbers present in stored samples of the produced waters were so small as to cast doubt if any of these sulfate reducers were indigenous species, particularly since the separation tanks were subject to contamination and the bacteria present appeared to be more akin to common soil *Desulfovibrio* than to hydrocarbon-oxidizing types commonly found associated with oil. This doubt was substantiated by demonstrating the ability of strains of *D. hydrocarbonoclasticus* to grow in 28 of the 33 samples of produced waters. Dr. R. V. Hughes of the Pennsylvania Grade Crude Oil Association helped with the collection of these samples.

The recovery of sulfate-reducing bacteria from reservoir fluids coupled with their demonstrated ability to grow in such reservoir fluids and to release oil



Dr. William B. Rosenfeld, API Project 43A research associate, examining a Petri dish for the presence of bacterial colonies. At his elbow is a 24-quart pressure apparatus, E, used for the cultivation of anaerobes in an atmosphere containing no oxygen. In the bcakground are two five-gallon bottles, F and G, in which are grown large quantities of sulfate-reducing bacteria.

from solids by mechanisms described above suggest that such bacteria may have contributed to the migration and accumulation of petroleum in past geological ages. The rather common presence of sulfide and the relatively low sulfate content of many waters associated with oil[52] adds weight to the argument that sulfate-reducing bacteria have been active in such environments. The fact that certain *Desulfovibrio* species can grow at temperatures at least as high as 80° C. and at salinities up to 300,000 parts per million is also significant. Methane-producing bacteria and other physiological types may likewise have contributed to the migration and accumulation of oil.

Various environmental factors and certain fortuitous circumstances probably determined whether oil-releasing bacteria were present or active in petroliferous sediments. This assumption is based upon analogy from the more thorough study of the factors which influence the distribution and activity of bacteria in soil.[70]

Although the experimental work summarized in the foregoing sections is still in the preliminary stage, and while some of the conclusions are highly speculative, the results suggest considering the introduction of appropriate bacterial cultures into oil-bearing formations for the purpose of increasing the secondary recovery of oil. Carefully selected varieties of bacteria may prove to be especially beneficial in relatively shallow wells in limestone formations where conventional acidizing is indicated. If successfully introduced, bacteria might be expected to permeate the formation in an ever-increasing sphere, producing acid, wetting-agents, and carbon dioxide and crowding oil off solid surfaces by virtue of the affinity of the bacteria for solids. The bacteria may also prove to be beneficial in the secondary recovery of oil from formations in which water flooding or water repressuring is practiced. Another possible practical application of oil-releasing bacteria is the separation of oil from tar sands, oil-saturated shales, and similar oil-bearing sediments.

The experimental work has not progressed far enough to make any definite recommendations. Much additional research work will be required to provide answers to numerous questions regarding the introduction of bacterial cultures into oil-bearing formations Those who are inclined to try the procedure are warned that only failure can be expected to result from the haphazard introduction of bacterial cultures into oil-bearing formations.

The method of introducing bacterial cultures into oil-bearing formations and the kind of culture to be introduced will depend upon the nature of the formation. The latter must be carefully diagnosed as to temperature, salinity, sulfate content, indigenous bacterial population, and other conditions that may influence the results. Cultures must be selected which are able to grow at the temperature, salinity, and hydrostatic presssure of the formation. Preliminary tests should be conducted in the laboratory to demonstrate the ability of the selected bacteria to grow in the reservoir fluid of the well or formation to be treated. Sulfate-reducing bacteria cannot be expected to grow unless sulfate is present All bacteria require a suitable source of food and energy.

Preliminary Tests

Preliminary tests should also be conducted in the laboratory to determine whether the bacteria may have an inimical effect on the oil or the formation. Some bacteria destroy oil[55, 65, 67, 79] and others tend to decrease the permeability of oil sands.[3, 37, 40] Certain types of bacteria cause the corrosion of iron and steel structures.[2, 23, 34, 27, 43, 59, 60, 61] Obviously, harmful types of bacteria must be avoided. If preliminary analyses reveal that bacteria are already present in the formation, little or nothing may be gained by the introduction of additional organisms, although this will depend upon the types of bacteria present.

The introduction of a little nutrient material along with the bacterial cultures may promote the implantation and oil-releasing activity of the bacteria. This procedure may be most practicable where water flooding is practiced. Otherwise the added nutrients would be available to the bacteria only in a relatively small sphere. In order to be effective in the recovery of oil, the bacteria must permeate the oil-bearing formation for a considerable distance.

Desulfovibrio species appear to be admirably adapted for permeating sedimentary materials in which they grow. Sulfate-reducing bacteria are by no means dependent upon the movement of fluids for their dissipation in sediments. During their "swarm" stage the bacteria themselves are actively motile by means of flagella, and they also propel themselves by a process known as protoplasmic extrusion or extension

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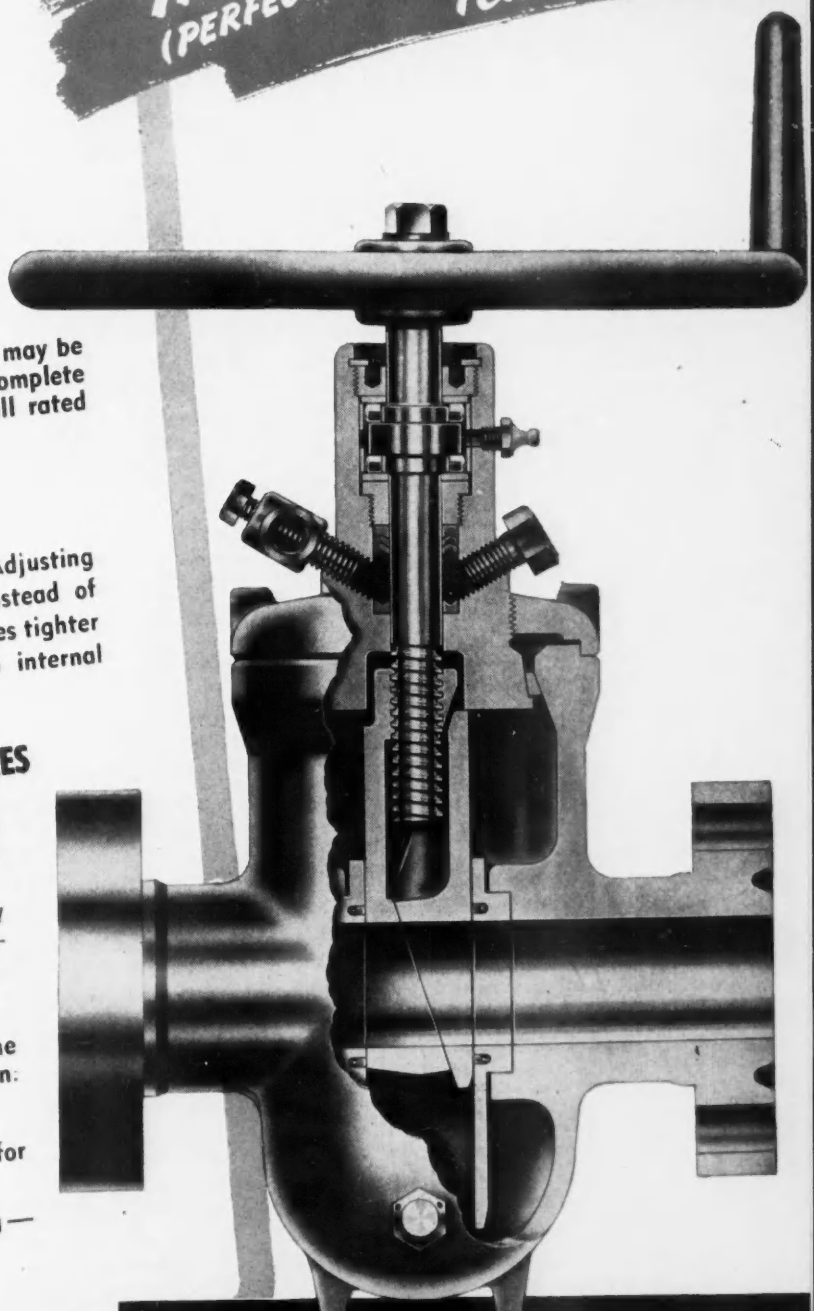

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during cell divisions. The bacteria were found to move through a water-saturated mixture of fine sand and calcium carbonate at an average rate exceeding one inch per day. Migration was equally rapid in all planes.

The author is aware of no practical application that has been made of bacterial cultures for recovering oil from oil-bearing sediments, but preliminary investigations have produced promising results.

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Much of this work has been done under the auspices of The API as a part of Research Project 43A. It is a pleasure to acknowledge the suggestions and stimulating criticisms of members of The API Advisory Committee on Fundamental Research and especially the help of G. C. Gester and G. M. Knebel in obtaining samples and otherwise expediting the work. Carl A. Young, director of the division of production of The API, also has contributed in many ways to the success of the project and was instrumental in obtaining patent protection for the public.

In accordance with the policy of The API and the University of California that all information resulting from fundamental research projects shall be made available to the public without charge, U. S. Patent No. 2,413,278, covering the bacteriological process for treatment of fluid-bearing earth formations, was assigned by the author to The API and dedicated to the public.[20]

It is not feasible for either the University, The API, or the author to provide further free information or cultures, their being neither funds nor facilities for such applied work. The author has no cultures for sale and is devoting his full time to further fundamental research work, the results of which will be reported in scientific or trade journals. Although he would like to answer every query in detail, he has been completely overwhelmed by the hundreds of requests for cultures, information, advice, etc. Oil companies or private enterprises will have to undertake any work that is done with a view to practical applications.

The Pennsylvania Grade Crude Oil Association has made important contributions to the study of the problem, some of which helped to secure patent protection for the public. The support of members of its Research Committee and especially that of Dr. R. V. Hughes, director of production research, is appreciated. This organization has been conducting a research project on the possible use of bacteria in the secondary recovery of oil with Dr. Jay V. Beck in charge. It is expected that the results of this project will be published.

Summary and Conclusions

The propagation of bacteria in nutrient media overlayering samples of Athabaska tar sand has resulted in the liberation of crude oil from the sand. Pure or partially purified cultures of sulfate-reducing bacteria slowly caused the disintegration of tar sands without perceptibly modifying or destroying any of the liberated oil.

Crude-oil was also liberated from samples of Santa Maria oily shales and other oil-saturated shales by bacterial activity. Bacteria released no oil from samples of oil shale which contained no free oil. Bacteria likewise failed to release oil from natural rock asphalt, gilsonite, or ozocerite. Traces of oil were released from certain oil-bearing sand cores.

The mechanisms by which bacteria liberate oil from solids have been investigated by experimenting with synthetic sediments saturated with oil. Certain clays and colloidal materials adsorbed oil so tenaciously that it could not be removed by treatment with either solvents or bacteria.

The decomposition of oil-saturated sulfate rocks, such as gypsum, anhydrite, or plaster of paris, by sulfate-reducing bacteria tends to liberate oil. Acids produced by bacteria help to dissolve calcium salts and particularly carbonate rocks. Adsorbed oil is released and void or pore spaces are formed, thereby providing for the migration or accumulation of oil. Hydrogen-oxidizing bacteria that reduce carbon dioxide to methane or carboxylic acids may contribute to the decomposition of carbonates.

Carbon dioxide, produced by respiring bacteria or resulting from the actions of acids or carbonates, tends to decrease the viscosity of oil. Tiny bubbles of the gas have a bouyant effect on oil droplets. Methane produced by bacteria may dissolve oil from solids or it might help to displace oil from micro-traps.

The affinity of certain bacteria for solid surfaces promotes the removal of films of oil or grease. The ability of bacteria to reduce the surface tension of nutrient media is also believed to be a factor which contributes to the liberation of oil.

Petroleum hydrocarbons bound by organic matrix in plant and animal remains might be released by the selective decomposition of organic matter.

Possibly playing a part in the separation of oil from solid sediments are many different physiological types of bacteria of which sulfate reducers appear to be the most versatile and most widely distributed in sediments. Some of the more salient properties of sulfate reducers, including their morphological and cultural characteristics, are summarized. Under certain conditions the growth of sulfate reducers in oil-well brines may exert a plugging action in oil sands or they may promote the corrosion of iron or steel structures. Methane-producing and hydrogen-liberating bacteria also contribute to the release and movement of oil.

Although some of the foregoing conclusions are based upon rather fragmentary data or conjecture, it is believed that bacteria may have played an important role in the liberation, migration, and accumulation of oil throughout the geological ages. Various environmental factors and certain fortuitous circumstances probably determined whether oil-releasing bacteria were present or active.

All that can be said regarding the practical use of bacteria to increase the recovery of oil from oil-bearing formations is that it appears to be a promising field for further investigation. Much more experimental and developmental work will have to be done by trained microbiologists in cooperation with petroleum engineers before any definite recommendations can be made.

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German Equipment Used In Fuel Manufacture Arrives

The Bureau of Mines announced last week that several pieces of massive German industrial equipment employed during the war in the production of synthetic liquid fuels for the Nazi air and ground forces have been brought to this country and consigned to the Missouri Ordnance Works for study. Included in the shipment were sample lots of German-made catalytic materials.

The shipment consisted of a giant hydrogenation-process converter weighing 130 tons, reportedly the heaviest single piece of equipment ever to be moved through the port of New Orleans. Sixty feet long and cylindrical in form, with a maximum diameter of seven feet, the converter was unloaded from the Lykes Lines vessel SS William Thornton by removing all standing rigging on the after starboard side to make way for marine derricks which were used instead of the lighter ship's gear. A special heavy-duty flat car—one of only six such rail cars in the country, had to be moved to New Orleans from Chicago to carry the converter to Missouri.

Other bulky equipment to be examined in detail and used as a guide in preparing American designs includes a ten by 18-foot gas synthesis process converter and a four by 60-foot "wickelofen" type heat exchanger, each weighing 60 tons; two six by 30-foot coal paste injectors weighing 30 tons each; and a three by 50-foot hairpen bend from a paste preheater weighing seven tons.

A Linde-Frankl oxygen plant unit, with a capacity of 25,000 cubic feet of oxygen per hour, also has been received and will be reassembled at Louisiana, Mo., where Missouri Ordnance Works is located, for use in the bureau's synthetic fuels experiments. Other equipment received included a DeLaval centrifuge and special purpose valves, fittings, lens gaskets, and instruments.

Some 580 drums containing various types of hydrogenation-process catalysts and several additional drums of vapor-phase hydrogenation catalyst were obtained to determine the merits of the German-made catalysts in processing American coals.

Gilbertown: OIL OUTPOST

By WALTER B JONES and WINNIE McGLAMERY

EXPLORATORY DRILLING in Alabama has resulted in the discovery of a single oil field at Gilbertown in Choctaw County, along the northern flank of the Hatchetigbee anticline. The producing area is ten miles long and from one to three locations wide, and divided into two sections, West Gilbertown, the original strike made by H. L. Hunt of Dallas in 1944, and East Gilbertown, opened up by The Carter Oil Company about 18 months later. Production is from fractured zones along the fault plane in the Selma chalk and from the Eutaw, with one well producing from both horizons. Through May, 1947, the area had produced 777,575 barrels of 17-gravity oil.

ALONG the northern flank of the Hatchetigbee Anticline lies the Gilbertown pool, the first commercial oil field to be discovered in Alabama. Relatively small when compared with other oil pools in the country, it is of importance as an outpost in the still undeveloped Southeastern Province and is an indication that perhaps some day the area will contribute its share to the nation's oil reserves.

Gilbertown was discovered February 17, 1944, by H. L. Hunt's A. R. Jackson 1. On August 9, 1945, The Carter Oil Company completed Sam Alman 1, the discovery well for East Gilbertown.

The pool is in the central part of Choctaw County in southwestern Alabama, and extends from near the Mississippi line eastward towards the Tombigbee river. West Gilbertown is controlled by Hunt Oil Company and East Gilbertown by Carter. The pool is about 10 miles long and from one to three locations wide, generally one. Further exploration may extend its limits east and west.

Stratigraphy

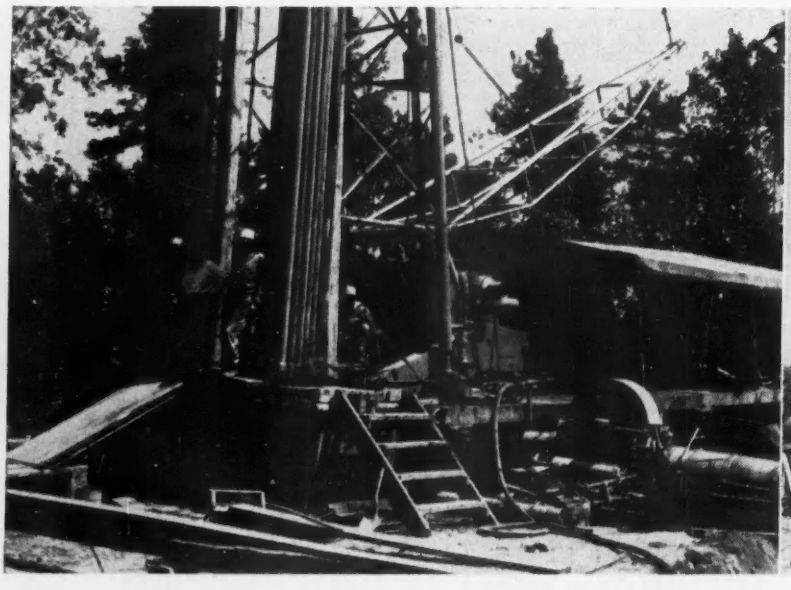
Eocene beds extend from the surface to a depth of about 2000 feet. Several good sand bodies have been found in the Wilcox group but all carried water, with no shows of oil or gas. Beneath the Eocene is a normal series of Upper Cretaceous including, from top to bottom, the Selma, Eutaw and Tuscaloosa formations. The Selma is about 1100 feet thick and consists of light gray chalk and marl. The Eutaw is about 450 feet thick and is composed of silty to non-silty, porous to fairly tight, fine- to medium-grained glauconitic sandstones and glauconitic sandy shales. It is believed to be the source of the oil in the field and is one of the producing horizons. The Tuscaloosa formation is about 1100 feet thick and may be divided into three horizons, from top to bottom: Upper Tuscaloosa, Marine section, and the Massive sand. The Upper Tuscaloosa is a series of sands and shales about 550 feet thick. The Marine section is a group of glauconitic shales in the upper part, and gluconite sands in the lower part, both shales and sands slightly fossiliferous, and in all about 325 feet thick. The Massive sand, about 200 feet thick, consists of sand beds with occasional shale breaks.

Rentz 1, total depth 4979 feet, penetrated 177 feet into sands and shales of the Lower Cretaceous. Robert Land 1, total depth 5942 feet, went 442 feet into the Lower Cretaceous. These are the oldest beds yet encountered in the field.

Geologic Structure

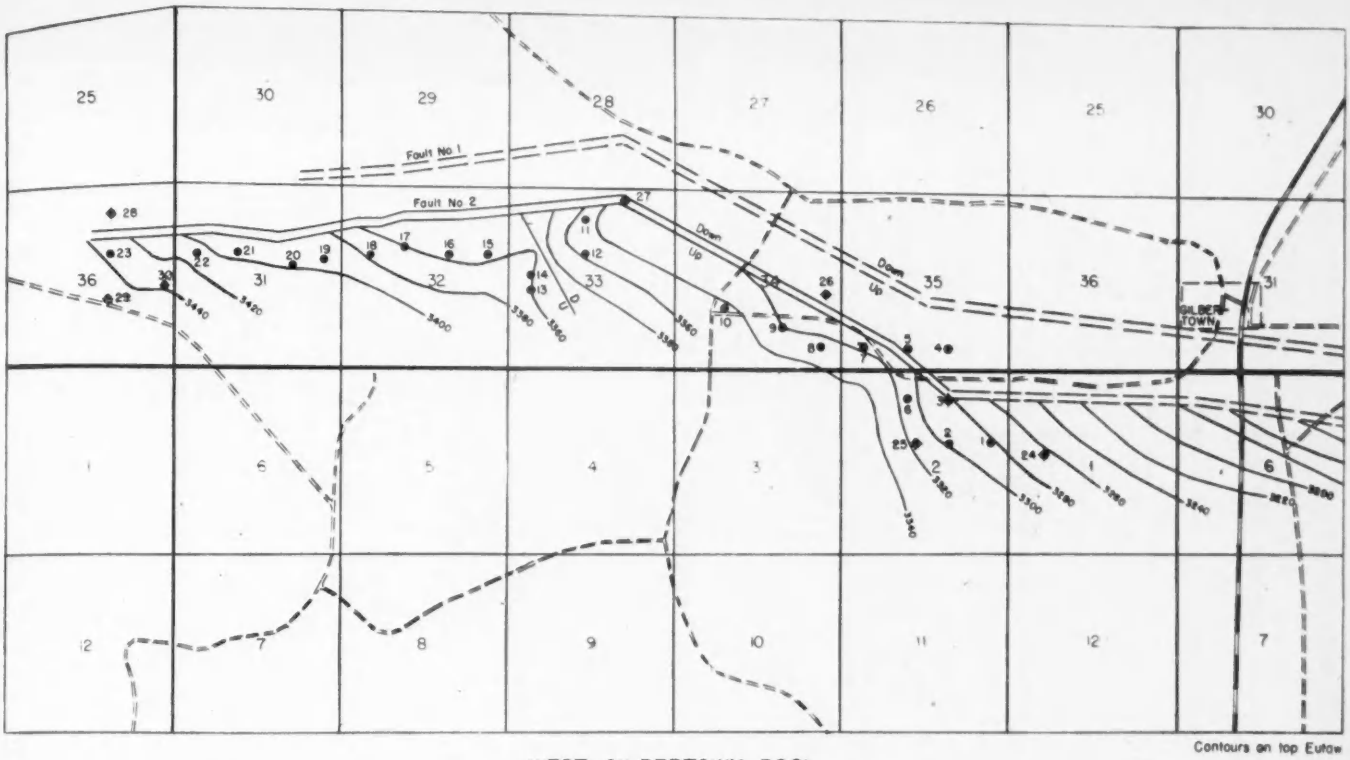
As previously stated, the pool is on the northern flank of the Hatchetigbee

Walter B. Jones is state geologist, and Winnie McGlamery is paleontologist, State Geological Survey of Alabama.



The Carter Oil Company's Sam Alman 1, discovery well of East Gilbertown pool.

F. M. Moseley 1, one of Carter's best producers.



Contours on top Eutaw

WEST GILBERTOWN POOL
UNDER LEASE HUNT OIL CO.

Anticline, one of the best-known structures in the Coastal Plain region of Alabama. In years past, several dry holes were drilled along the crest of the anticline. Discovery of surface faults on the north flank of the anticline led to the discovery wells by Hunt and Carter. How the oil migrated around to the north flank of the anticline is a matter for speculation. These writers believe it passed around the west side of the crest of the anticline and became trapped against the faults on the northern flank. There are two faults, roughly parallel, over most of the Gilbertown field, both downthrown to the north. From Robert Land 2 (No. 23 on the map) westward into Clarke County, Mississippi, it is believed that only one fault exists, downthrown to the north with a throw of about 300 feet. About the center of the Carter area, between Johnson 1 (No. 4 on the map) and Rentz 1 (No. 5 on the map), the two faults merge into one, with a displacement of 856 feet, as shown in the Rentz well. Only one fault shows in Rex Alman 1 (No. 8 on the map), with a throw of 570 feet. All faults are normal, and dip approximately 45 degrees to the north. In this field the displacement of faults is sufficient to bring the porous sand of the Eutaw against the non-porous beds of the Selma chalk, thus making an effective trap.

In view of the larger displacement in Rentz 1 and lesser displacement in Rex Alman 1, it is thought that the throw increases with depth. This would signify that faulting was active during the time of the Selma deposition and continued active through the Eocene. Surface displacement is generally much less than that encountered in the Upper Cretaceous. The extra 330 feet thickness of the Selma in the Rentz 1 also suggests deposition on an active downthrown fault block.

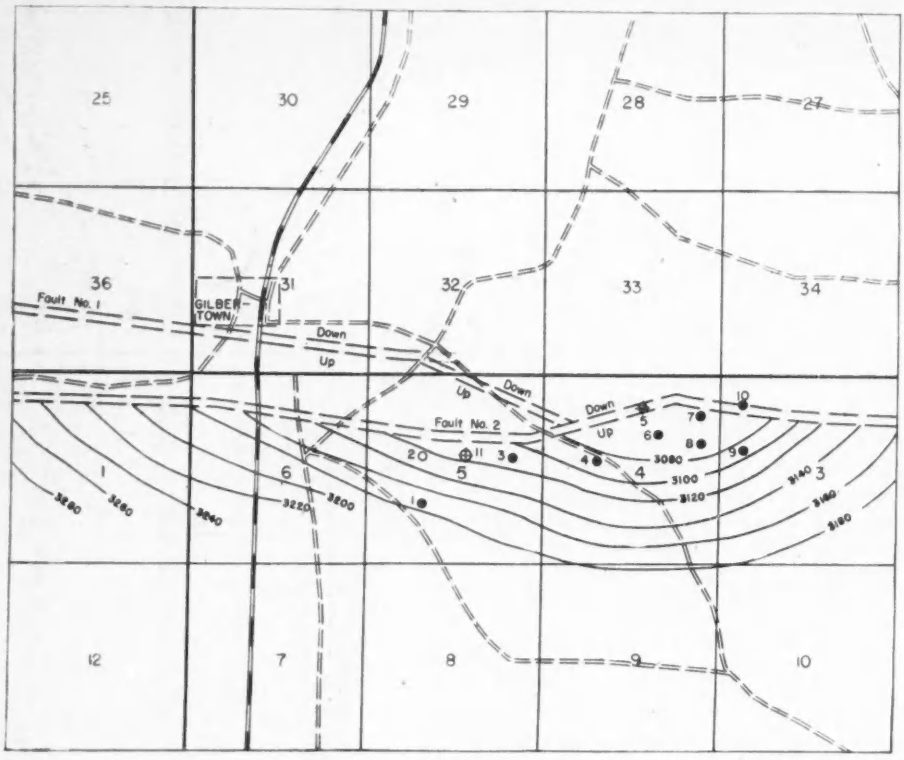
Pending further exploration in the eastern part of the Carter area, and on the Tombigbee River, the situation must remain unknown. It is thought, however, that the Gilbertown fault will connect with the Jackson fault, across the Tombigbee River in Southern Clarke County (Alabama). If so, that area should receive a great deal of attention. To the west there already is production from the Eutaw at the western terminus of the Gilbertown fault in Clarke County, Mississippi.

West Gilbertown Pool

Well No.	NAME	Producing Horizon	Depth	Production, May 1947 (Bbls.)
1	A. R. Jackson No. 2	Selma	2845–65	791
2	A. R. Jackson No. 1	Selma	2575–85	1,603
3	J. T. Dogett No. 1	.....	.....	(Could not complete as producer)
4	W. J. Trice No. 3	Selma	2555–70	935
5	W. J. Trice No. 4	Selma	2552–65	345
6	J. T. Doggett No. 3	Selma	2620–2630	1,220
7	W. J. Trice No. 1	Selma	2639–50	1,407
8	E. (or C. H.) Utsey No. 1	Selma	2590–2620	1,395
9	H. G. Smith No. 1	Selma	2560–2600	1,236
10	W. J. Trice No. 5	Dry Hole	.....	.....
11	Maggie Utsey No. 2	Selma	2586–93	1,343
12	Maggie Utsey No. 3	Eutaw	3481–87	1,356
13	W. S. Scruggs No. 2	Eutaw	3478–88	890
14	Maggie Utsey No. 1	Eutaw	3475–83	1,286
15	W. S. Scruggs No. 1	Eutaw	3502–12	706
16	Boney-Scruggs No. 1	Eutaw	3564–72	399
17	J. M. Boney No. 3	Eutaw	3559–69	2,239
18	J. M. Boney No. 4	Eutaw	3569–?	1,632
19	Robert Land No. 5	Selma	2880–2930	1,236
20	Robert Land No. 4	Selma	3068–74	1,164
21	Mary Green No. 2	Eutaw	3532–42	267
22	Mary Green No. 1	Selma	2816–26	935
23	Robert Land No. 2	Selma	3188–3220	621
24	A. L. Jackson No. 1	Dry Hole	.....	.....
25	J. T. Doggett No. 2	Dry Hole	.....	.....
26	W. J. Trice No. 2	Dry Hole	.....	.....
27	J. M. Boney No. 2	Dry Hole	.....	.....
28	J. M. Boney No. 1	Dry Hole	.....	.....
29	Robert Land No. 1	Dry Hole	.....	.....
30	Robert Land No. 3	Dry Hole	.....	.....

Producing Horizons

Wells in the field are producing from fractured zones along the fault plane in the Selma chalk, and from the Eutaw. One well Caroline Moseley 1 produces from both horizons. Each horizon generally requires closure against or close to the fault. Production in the Selma ranges from 2502 feet (in Caroline Moseley 1) to 3220 feet (Robert Land 2). In the Eutaw, the minimum producing depth is 3179 feet (E. A. Rentz



Contours on top Eutaw

EAST GILBERTOWN POOL
UNDER LEASE CARTER OIL CO.

East Gilbertown Pool

Well No.	NAME	Producing Horizon	Depth	Production, May 1947 (Bbls.)
1	Sam Alman No. 1	Eutaw	3336–3401	307
2	Caroline Mosley No. 1	Selma Eutaw	2502–2693 3255–3321	1,604
3	A. L. Alman No. 1	Eutaw	3244–3370	931
4	Johnson No. 1	Eutaw	3310–20	1,612
5	E. A. Rentz No. 1	Dry Hole	.....	.....
6	E. A. Rentz No. 2	Eutaw	3179–3203 3253–81 3190–3218	Awaiting pump. Est. Cap. 100 B/D
7	Rex Alman No. 2	Eutaw	3223–55 3265–80	2,926
8	Rex Alman No. 1	Eutaw	3265–3302	2,197
9	Hubert Moseley No. 1	Eutaw	T.D. 3287	Awaiting pump. Est. Cap. 100 B/D
10	F. M. Mosley No. 1	Eutaw	3183–3272	3,269
11	A. L. Alman No. 2	Dry Hole	.....	.....
12	T. E. Long No. 1	Drilling	.....	.....
13	M. Adams No. 1	Drilling	.....	.....
14	F. M. Johnson No. 2	Location	.....	.....
15	E. Abston No. 1	Location	.....	.....

2) and the maximum is 3572 feet (Boney-Scruggs 1).

It is evident that the oil originated in the Eutaw. The porous and permeable beds of this formation make their appearance about 120 feet below the top of the formation itself. Below the top of the porous beds there are shale breaks which divide the oil-bearing zone into two and even three parts. The Eutaw has a porosity of about 32 percent. Permeability ranges from 100 to 178 millidarcys. Gravity of the oil, both from the Selma and Eutaw, averages 17 degrees. It is a black asphaltic base oil. Thirteen wells produce from the Selma, 1 from the Eutaw, and 1 from both formations.

Production

Actual production began in February, 1944, when 77 barrels were taken from each of the A. R. Jackson (Nos. 1 and 2) wells. Total production from the West Gilbertown pool from February, 1944, through December, 1946, was 560,986 barrels. In the East Gilbertown pool actual production began in September, 1945, when 539 barrels were taken from Sam Alman 1 and 149 barrels from the Caroline Moseley 1. From that date through December, 1946, 58,292 barrels were produced in the East Gilbertown pool. Total production for both pools from January through May, 1947, was 158,297 barrels. Grand total for the field through May, 1947, was 777,575 barrels.

Drilling Units

On the basis of heavy oil, medium porosity, lack of gas and uncertainty of effectiveness of water drive, drilling units of 40 acres have been established. Likewise, a maximum limit of 100 barrels per well per day is being contemplated by the State Oil and Gas Board. Even so, it is doubtful if more than 25 percent of oil in the reservoir can be recovered ultimately.

Distribution

Oil from the field at present flows through a pipeline to a terminal on the Tombigbee River, whence it is sent by barge to the refinery of the Placid Oil Company (Hunt Oil Company subsidiary), on the Warrior River at Tuscaloosa, Ala. Capacity of the refinery is 4000 barrels daily. The pipeline takes oil from the Langsdale (Clarke County, Mississippi), West and East Gilbertown pools. Main product of the refinery is asphalt, in many grades. Some of the asphalt products are extorted. Excess distillates are sent to other refineries

Acknowledgments

The authors give thanks to the Hunt and Carter companies for information covering their respective areas; and to the Shreveport Geological Society for fundamental data on base and contour maps.

Emissary Recalled to Discuss Seizure of U. S. Oil Property

Joseph M. Dodge, American representative on the Austrian treaty commission, has been recalled by the State Department for consultation on the recent seizure of American oil property in Austria by Russia and other unilateral actions of the Soviets in taking over properties that are still a matter of discussion by the Commission.

Purpose of the recall is to enable the Department to obtain first-hand information from Dodge on the Soviet actions so that a better understanding might be had in the Department on the exact situation for further talks with the Russians on the problem.

H. H. Wegener Sells Producing Properties in West Edmond

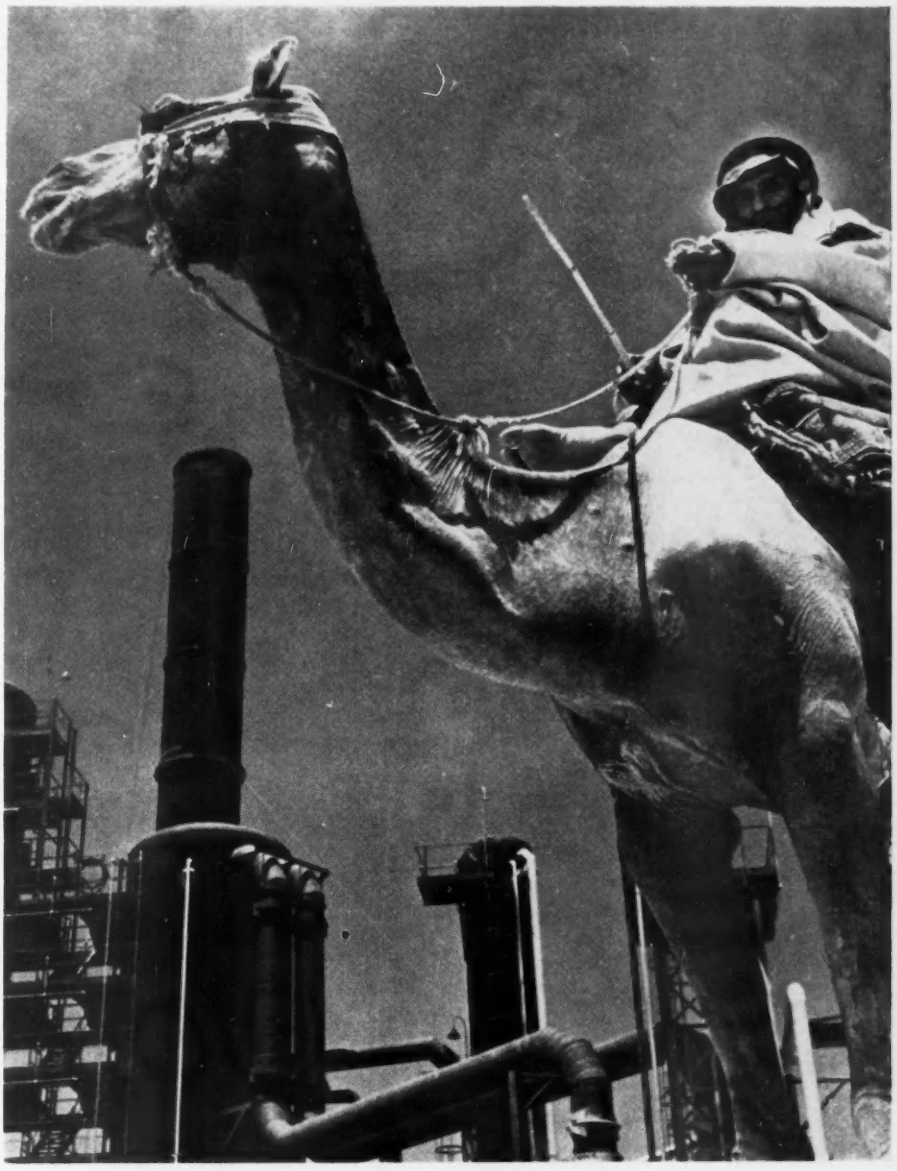
H. H. Wegener, veteran drilling contractor and independent oil operator, has sold his producing properties in the four-county West Edmond oil field of Oklahoma, to the West Edmond Oil Company, a new corporation.

Consideration was estimated at $2,425,000 but the new owners will accept oil runs from the leases as of June 1. West Edmond Oil was incorporated recently in Delaware and two weeks ago filed its charter in Oklahoma, listing paid in capital of $1,872,000.

The properties include 15 wells on six leases through the central part of the field. All wells are making their 81-barrel daily allowable. An over-riding royalty interest on one lease, held by Mrs. Wegener, was not included in the deal.

Service Firm Sold

H. John Eastman, president of Eastman Oil Well Survey Company, announced the purchase by his company of the Oil Field Service Company of California.



Oil Makes the Desert Bloom

IN ONE huge stride the countries of the Middle East are seeking to draw abreast of the remainder of the civilized world. The magic of oil is making it possible to bridge the centuries-old gap between the way of life and economic level of these countries and of their western neighbors. Oil royalties from their rich fields are making it possible to embark on a modernization program designed to make the desert productive through irrigation, and to furnish transportation systems for making all parts of the nations accessible by rail or highway.

By HENRY OZANNE
Staff Writer

UNDER the magic touch of U. S. oil firms the Middle East is transforming itself into a new land of plenty and prosperity. That cradle of civilization between the Red Sea and the Persian Gulf—dormant for 1000 years—is awakening to a new life, and the key which is opening to it the marvels of the modern age is oil.

Three Middle East countries already have embarked on gigantic development and improvement programs, financed by petroleum royalties. King Ibn Saud has announced that by 1951 Saudi Arabia will have spent $270 million on internal projects; Iraq has just disclosed its Ten-Year Plan designed to metamorphose that great desert into a modern Garden of Eden; and Iran is mapping a welfare program to raise the living standards of her whole population.

All of these huge undertakings will be financed chiefly by oil—by American oil solely in Saudi Arabia, and partly by American oil in Iraq through participation of U. S. interests in the Iraq Petroleum Company, and in Iran through announced association of U. S. firms in the Anglo-Iranian pipe line project.

Saudi Arabia's Program

Saudi Arabia's impending program of modernization is one of the most extensive of any country on earth today, according to plans recently made known by Fuad Bey Hamza, newly named Saudi Arabian Minister of Development. Railroads, motor roads, ports, electrification projects, irrigation, farm development, schools and hospitals are on the construction docket. The amount which Saudi Arabia will spend during the next four years on all internal projects is 27 times that nation's prewar budget. Of the country's income, by 1951 Saudi Arabia will be receiving $50 million annually from oil—a sum more than the total budget of any other Arab state except Egypt.

It is believed that Saudi Arabia's modernization work will affect in a direct way the life of almost every one of its 5 million subjects. The ways of the desert are giving way to patterns of community living; primitive work methods in use since the days of Abraham are being displaced by power modes built on oil. So rapidly is the machine-

Typical Bedouin encampments contrast sharply with modern installations of American oil companies (right).

age transformation taking place in Arabia that Ibn Saud's people are being caught up in a whirl of progress that has required centuries for other nations to achieve.

The new port on the Persian Gulf at Damman, field headquarters for the Arabian American Oil Company, is the first large project contemplated and work on it is already under way. Aramco is lending Ibn Saud $40 million for the port and for the railroad line projected from Damman to Saudi Arabia's capital, Riyad. This loan will be repaid to the Americans from oil royalties.

Trans-Desert Railroad

The railroad, to be completed in 1950 at a cost of about $27½ million, will cross 350 miles of desert to link Riyad with Hofuf, largest city on Arabia's east coast.

The Red Sea port of Jidda will be improved and extended to become an important point of entry for all western Arabia, while a rail line is mapped from Jidda to the holy cities of Mecca and Medina, a distance of another 350 miles. To realize this project, Ibn Saud is negotiating for a $20 million to $25 million loan from the U. S. Export-Import Bank.

The old Hejaz railroad, constructed under the Turks for the ostensible purpose of carrying pilgrims from Damascus to Medina, actually was a highly strategic military line in German conquest plans during World War I. This railroad still is in use between Damascus and Maan, Transjordan, but the Mecca link has been destroyed since the operations of Lawrence of Arabia 30 years ago. Engineers are studying the feasibility of rehabilitating the Mecca-to-Medina part of the rail line.

Saudi Arabia will build more than 1200 miles of good automobile roads in addition to the 1100-mile road which Aramco will construct along the pipe line right-of-way from the Gulf to the Mediterranean coast. These rail and auto roads will supplant the old caravan trails in use throughout Arabia for the last 3000 years, and the new communications system will be one of the main ties in the stepped-up program transforming Saudi Arabia from a feudal, backward land of poor bedouins into a modern industrialized state.

Other items in the vast modernization plan of Saudi Arabia are air fields at Riyad, Mecca and other cities, improved air service across the entire country, electrification of the cities of Mecca, Medina, Riyad, Jidda, Hofuf and Taif, as well as new and sanitary water installations for Jidda, Mecca and Riyad.

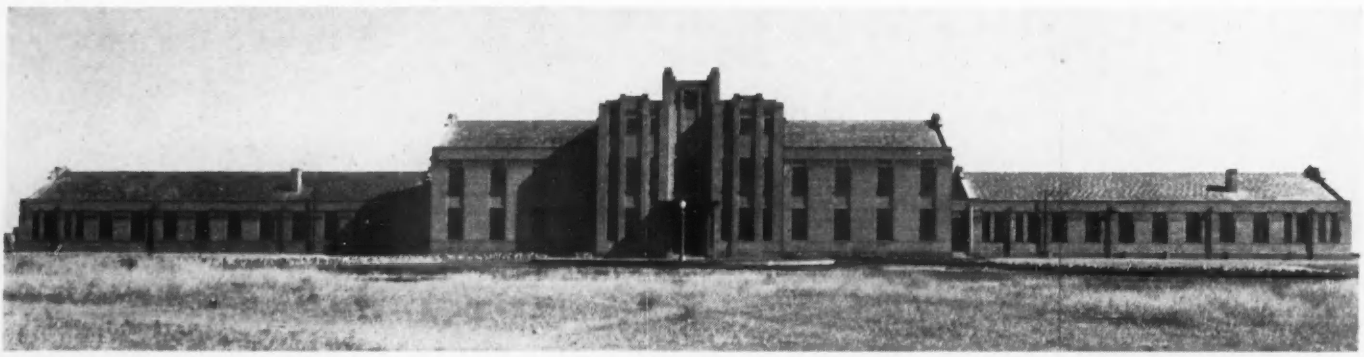
An education mission from the U. S. recently surveyed Saudi Arabia preparatory to setting up a modern elementary education system there, a project in which it is understood Aramco is keenly interested.

Iraq's Modernization

Meanwhile, the young nation of Iraq is pushing energetically its own plans for modernization. Iraq's aim, according to Prime Minister Sayid Salih Jabr, is to make true once more the words spoken of that land by the ancient Greek historian, Herodotus: "Of all the lands we know, none is so fruitful." After seven centuries of stagnation and invasions Iraq is blue-printing a new Garden of Eden, the first Arab country ever to take its economic salvation into its own hands through the new Ten-Year Plan.

Under Prime Minister Jabr six committees of experts have been set up in the Iraq government. They will be responsible for the implementation of the new program to a Central Planning Board, the members of which are to be selected soon. The Ten-Year Plan is based on the efficient use of water power, which is the source of all wealth and even life itself in Iraq. But the plan is more extensive than agriculture alone —it will also affect industry, Iraq's social services, schools and hospitals.

Iraq has two vitally important rivers, the Euphrates and the Tigris. Like the Nile in Egypt in ancient times, the Tigris still does great damage at seasons in



The Iraq Petroleum Company's Administration Building at Kirkuk injects a note of modern architecture into the desert.

Iraq, overflowing its banks and flooding communities and land. Baghdad has suffered so many floods that its inhabitants regard such calamity as a regular visitation of the devil. Since antiquity great efforts have been made to control the Tigris. Now that effort is about to bear fruit.

The Euphrates, too, often is rampageous. With British help, the Iraq Irrigation Development Commission made noticeable headway in river control from 1920 to 1939. The plan was to turn the natural Habaniya Lake into a reservoir with a capacity of 2500 billion cubic meters. From this an irrigation network could have drained an area of 494,000 acres. This plan, suspended during the war, is revived in Iraq's new program.

Two main irrigation schemes are projected. The first is to prevent floods in the Tigris Valley by the erection of a great dam at Bekhme, that point in north Iraq at the juncture of the river's two main tributaries, the Greater Zab and the Rowanduz. In the barren foothills of the Khurdish Mountains a spectacular 40-mile long lake will be created. In spring, the snow water from Khurdistan will be stored and used, partly for irrigation, partly for electric power. It is hoped that the electric power ultimately created will satisfy all of Iraq's needs.

The second, possibly an alternative scheme, deals with a desert river, the Wadi Tharthar, which flows southward between the Tigris and the Euphrates, and loses itself in a region of marshy flats. Waters will gradually fill an artificial lake with a capacity of 70 billion gallons, about twice the size of the Boulder Dam lake.

Under its Ten-Year Plan, all of Iraq's economic structure will change greatly. Fertile soil will rehabilitate the date- and wheat-growing areas, and the government plans hundreds of experimental farms.

Unlike Saudi Arabia, Iraq is a relatively rich country now. The nation receives about $8 million yearly in royalties from the Iraq Petroleum Company. This income will increase with the opening of the new IPC line now under construction.

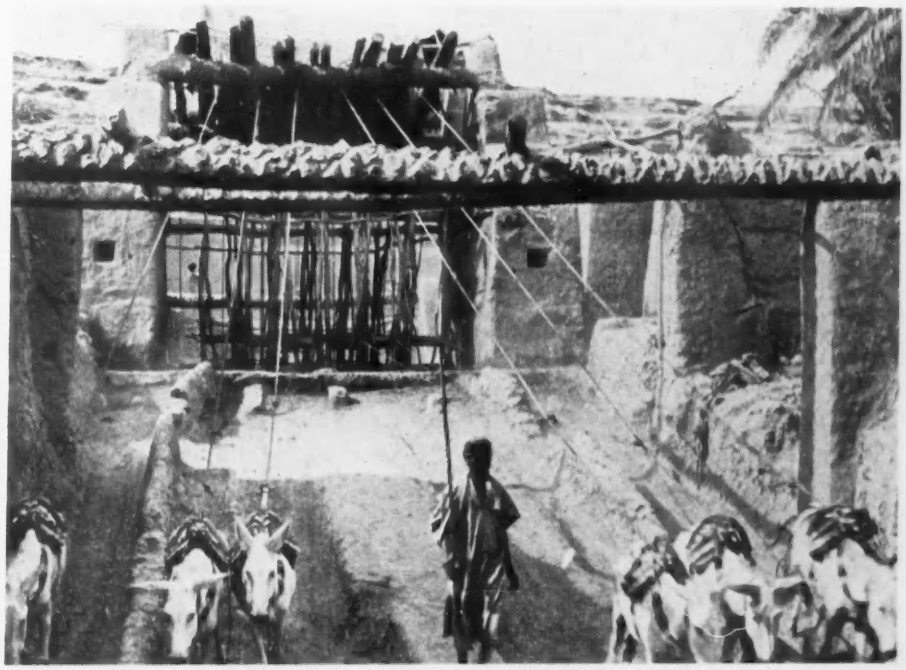
Benefits to Iran

In Iran, the Anglo-Iranian Oil Company, Ltd., is expanding its medical and health services and spreading wider economic benefits to the people. Last year the company completed 1236 permanent houses. Expenditures on roads, water lines, sewers, and materials for further building, ran to more than $11 million, while another $2½ million was spent on schools, shopping centers, theaters, canteens, and various accommodations.

Anglo-Iranian is furthering its plans for education, especially for the technical training of Iranians at the Abadan Technical Institute and other forms of training in the United Kingdom. The Iranian University has authorized expenditure of $600,000 for new equipment.

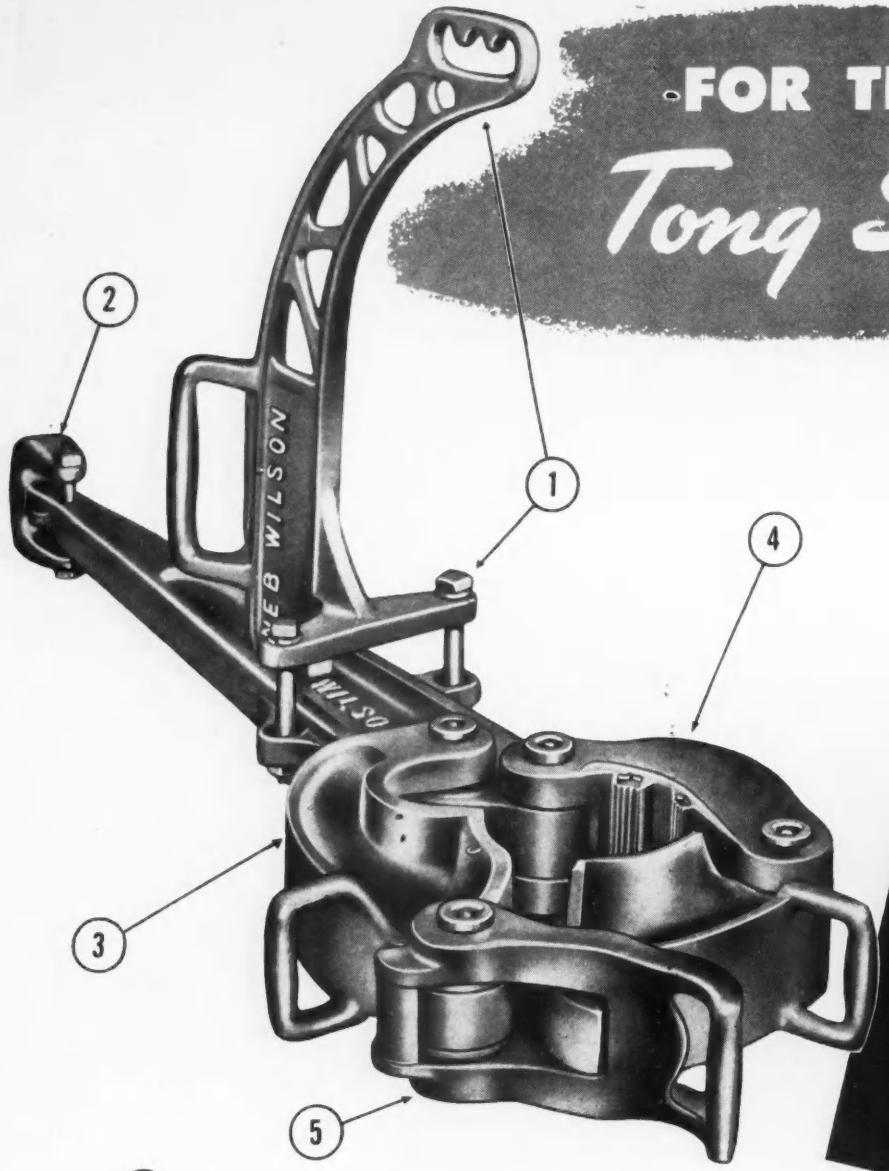
During the war the company supplemented wages of its workers by the issue of free rations and the sale of foodstuffs and goods at prices below cost. In addition, wages were increased to sustain higher living standards for thousands of national workers.

Even the tiny principality of Yemen on the southwest tip of the Arabian peninsula is looking toward the new modern world. Prince Saif al-Islam Abdullah visited the U. S. a month ago to advance his country's industrialization program. Yemen has announced its intention to purchase equipment for building roads, electrical equipment, and harbor facilities.



The age-old method of raising water by donkey-power is being replaced in Saudi Arabia by modern pumping machinery.

FOR THE BEST *Tong Service*



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WEB WILSON *Oil Tools*

WEB WILSON OIL TOOLS W. W. WILSON BUILDING **HUNTINGTON PARK, CALIF.**

Air view of the prairie country near Leduc, with No. 5 well in foreground.

Alberta
LEASE HOLDINGS

THE APPARENT economic significance of the important Leduc and surrounding areas in Alberta Province of Western Canada is reflected in the upsurge of all phases of activity since the beginning of the year. Holdings of acreage for oil and gas exploration and development increased around 20 percent between January 1 and June 30. Considerable activity involving lease and reservation property transferred, assigned, investigated and cancelled is not reflected in the total figures as of the beginning and end of the period.

By C. O. NICKLE
Staff Writer

OIL and gas rights owned, leased or reserved in Alberta Province, center of Western Canada's enlarged petroleum exploration program, increased by about 3½ million acres, or roughly 20 percent between January 1 and June 30 of this year. A check of all available data indicates that total holdings on June 30 amounted to an estimated 20,800,000 acres. This compares with an estimated 17,230,000 acres held on January 1.

The Alberta government, dominant holder of oil and gas rights in the province, advises that rights granted under lease or reservation to oil companies and operators increased by almost 2 million acres between January 1 and June 30. On June 30, the government had outstanding a total of 11,699,354 acres, made up of 98 geological or geophysical reservations totaling 10,614,375 acres, and 2715 leases totaling 1,084,979 acres. At the beginning of the year, rights granted totaled 9,730,742 acres, made up of 86 reservations totaling 8,603,892 acres, and 2685 leases totaling 1,126,850 acres.

Other oil and gas right holdings of oil companies in Alberta are made up of rights leased or reserved from the Canadian Pacific Railway, a large owner of mineral rights; leases from a host of owners of small parcels of "freehold" rights; and rights owned outright by such development or holding companies as the Hudson Bay Oil & Gas Company, Calgary & Edmonton Corporation, and Western Leaseholds, Ltd.

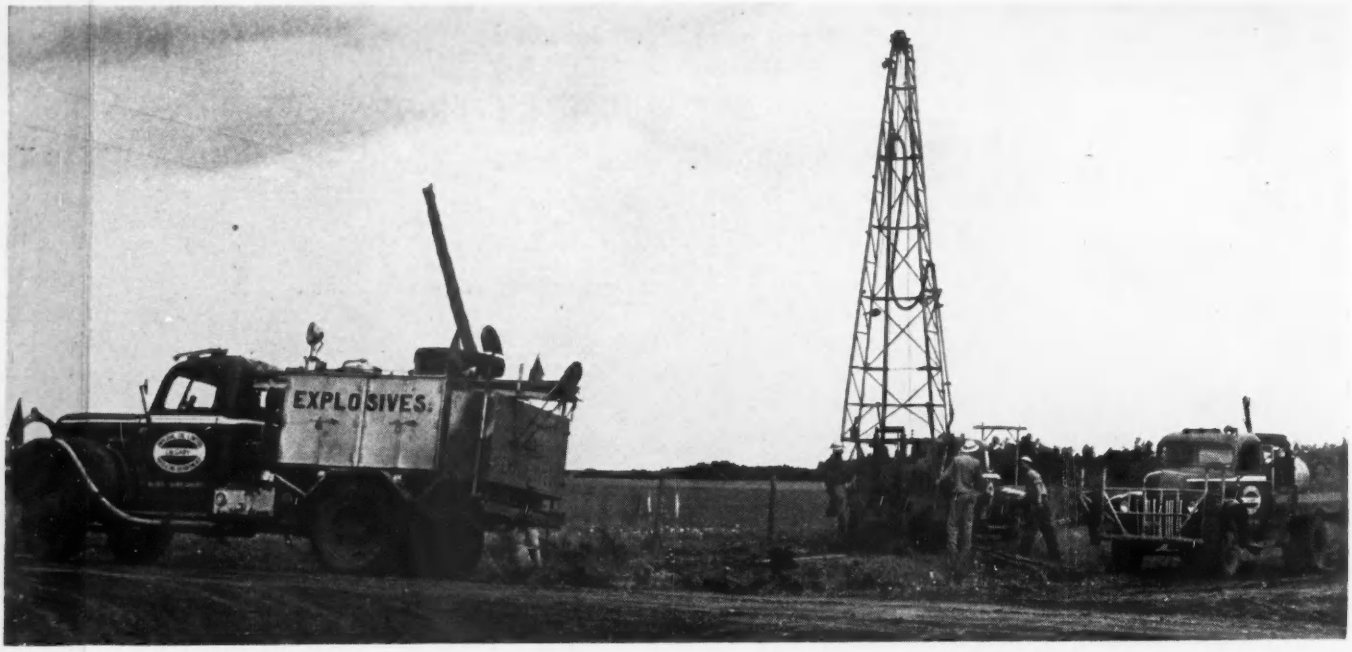
As nearly as can be estimated, the total of such rights held by oil companies as of June 30 was about 9,100,000 acres, compared with about 7½ million acres January 1.

The increase in total holdings in Alberta, of course, does not alone show the changing picture in the province. On the average, about 1½ million acres monthly have been involved in reservation or lease acquisitions, transfers from reservation to lease, assignments, and cancellations of all or portions of reservations following their investigation.

The Leduc discovery in February focused attention on that virgin region of Alberta lying between the Foothills Belt and the Central Eastern Plains. At the time of the discovery, lease and reservation holdings in this region totaled under 2 million acres. There are now more than 10 million acres under

Oil and Gas Fields and Larger Lease or Reservation Blocks in Alberta

Brazeau
RAM RIVER
Red Deer
CASTOR
PROVOST
Jarrow
CLEARWATER
DELIA
HANNA
Red
Lake Louise
Crossfield
Drumheller
Banff
JUMPING POUND
Calgary
MOOSE DOME
TURNER VALLEY
Bassano
PRINCESS
BROOKS
TILLEY
RAINY HILLS
SUFFIELD
MEDICINE HAT
MANY ISLANDS
ARMELGRA
High River
SHELL OIL
KEMIE
BARNWELL
BOW ISLAND
TABER
Lethbridge
MacLeod
CONRAD
MANYBERRIES
PAKOWKI
Cardston
TWIN RIVER
DEADHORSE COULEE
DEL BONITA
MAY LAKE
RED COULEE
PINHORN
SASKATCHEWAN
UNITED STATES
LEGEND
LEASE OR RESERVATION BLOCK
IMPERIAL - LEASE OR RESERVATION OWNER
OIL FIELDS
GAS FIELDS
Towns
SCALE MILES
0 10 20 30 40 50
Map by NICKLE MAP SERVICE, Calgary



Crew with portable drill and seismic truck starts operations at Leduc to determine site for new well.

lease or reserve in this region, in a northwest-southeast trending block around 300 miles in length, and ranging up to 150 miles in width. The block roughly centers on the Leduc field. In July, new reservation acquisitions indicated that the block would be pushed farther south and southeast to link up with the active areas around the city of Calgary and the Princess oil and gas area.

New Lease Regulations

Important new concessions to developers of Crown oil and gas reservations in Alberta, and important restrictions on the size and number and transfers of these reservations, were placed in effect during July by the Alberta government.

The changes reflect the continuing policy of the government, designed to offer all possible encouragement to the seekers of oil and gas, consistent with the greatest possible benefit to the Alberta people owning mineral rights. Changes made are considered warranted by past experience of the government and the industry, and by the altered picture for oil and gas in Alberta.

The changes apply on any reservations applied for after July 10, 1947, and do not affect any reservations previously issued or applied for.

The new regulations limit size of geological and geophysical reservations to a maximum of 100,000 acres, compared with 200,000 acres formerly. The maximum number of reservations which any individual or company may hold at any one time is two, compared with three formerly.

Formerly reservations were assignable. This led to a fair amount of "speculating" in Crown reservations. To eliminate this, new reservations are not assignable, but the owner may engage others to carry out the obligations involved, enabling companies to work in excess of 200,000 acres at one time through acquisition of reserves by subsidiaries.

"Credits" built up may be used only by the reservation owner, and are eliminated if leases acquired from a reservation are transferred. The reservations may be adjoining, permitting a maximum solid block for any one company or individual of 200,000 acres.

These restrictions are designed to insure a wider distribution of Crown reservations, more exploratory work per acre reserved, and to reduce acquisition of reservations for purely speculative purposes. While reservations are not assignable, it still will be possible for operators willing or able to work more than 200,000 acres to carry out the obligations on reservations issued to subsidiaries or individuals.

Reservation fees remain at $250, plus deposit of $750 per 20,000 acres on geological reservations, and $2000 per 20,000 acres on geophysical reservations. The deposits are returnable as equivalent sums are spent in exploration.

The new regulations affect a policy long followed by the Lands and Mines minister under his discretionary powers, and stipulate that no geological reservations will be granted in areas where adequate geological data is now available in the government's files. Only geophysical reservations will be granted in such areas.

New reservations may have a maximum length up to three times the breadth. Formerly the maximum length was twice the breadth.

Past experience has resulted in some important concessions to operators in the new regulations. Reservation period is now four months, but the reserve may be retained for up to three years through extensions, provided obligations are fulfilled. First two extensions, each for four months, will be granted without fee. Additional extensions of three months each, to a maximum of eight, are permitted on payment of a 12½ cents per acre fee per extension (equal to a 50 cents per acre per year fee).

Past Practice

Formerly reservations were granted for two months, with extensions up to one year from date of issue without fee. At the end of the year, up to four months' extension could be obtained by payment of 25 cents per acre fee. Up to six months' extension after the end of the first year could be obtained by commencement of drilling. Drilling credits so derived were applicable to leases (dated from one year after issue of reservation) acquired from the reservation within a 15-mile radius of the well.

Credits deriving from work on a reservation may be applied on extension fees for the second and third year of the reservation and/or on the $1 per acre per year fee for leases acquired within the reserved areas. A further important concession is that credits applied to leases are good up to five years from issue date of reservation. Formerly, reservation credits applied to leases were good only up to three years from issue date of the reservation. As a result, in a number of cases substantial credits built up by costly exploratory work

went to waste at the end of the three-year limit.

Major Interests Active

The largest single factor in Western Canada's expanded oil and gas search continues to be Imperial Oil, Ltd. With holdings in Alberta exceeding 4 million acres (not including its stake in widely scattered Hudson Bay O. & G. rights), Imperial leads the parade in terms of geological and geophysical work, and in number of drilling rigs active. In 1946, Imperial expanded the Northwestern Utilities' Viking-Kinsella gas reserve from 50,000 acres to about 250,000 acres, to provide itself with a gas reserve big enough to support a synthetic gasoline industry, when and if it be required. In February of this year, it made the Leduc discovery. Between 1939 and the Leduc oil strike, Imperial poured $13,-250,000 into Western Canadian exploration, plus millions into Turner Valley and Norman Wells field drilling. During the last decade, Imperial was responsible for half the western industry's geological work, a third of its seismograph work, and a fourth of exploratory footage drilled.

Now operating on a larger scale than ever before, Imperial has five seismograph parties and two gravity meters working its reservations. The company has five drilling rigs engaged in the Leduc field, will shortly add a sixth, and has four rigs engaged in wildcat drilling in the "Leduc region," currently at Looma, Morinville, Battle Lake and Paddle River. It is participating with four other majors in the million-dollar-plus Muskeg wildcat in the North Foothills of Alberta. A subsidiary, Royalite Oil Company, is drilling a wildcat at De Winton, while another subsidiary, Foothills Oil & Gas, is continuing development drilling in Turner Valley. The company's investigations are spread all the way from the Spirit River area in Northwest Alberta to the Waterton Lakes area along the U. S.-Alberta boundary.

McColl-Frontenac Oil Company, an affiliate of The Texas Company, is well advanced on a 1947 program dwarfing its previous efforts in Alberta. The company has a stake in over 2½ million acres in the province, including about 1,600,000 acres in a block in the Leduc-Wetaskiwin region, around 800,000 acres held jointly with Union Oil Company of California in the Pakowski-Manyberries region of Southeast Alberta, and 207,000 acres in the Muskeg area of the North Foothills. In 1946, McColl and Union made an important gas discovery at Pakowki and by mid-1947 had developed a large reserve in this area. In June this team made an important gas discovery at Manyberries, 14 miles east of the Pakowki field. The team has two rigs operating at Pakowki-Manyberries, plans to complete 25 wells in 1947. On the Leduc-Wetaskiwin holdings, McColl has three seismograph parties operating, is currently drilling wildcats at Wizard Lake and Wetaskiwin, a third wildcat jointly with Union at Bigstone Creek, and will shortly start a wildcat at Millet jointly with Ashley Mining & Oil Corporation, an independent. McColl is a participant in the Muskeg wildcat. Union of California, in addition to its joint operations with McColl, has commenced geological investigation of a reservation acquired in May in the Peace River area of Northern Alberta. Like most other majors, Union is considerably expanding its 1947 Western Canadian operations.

Gulf's Program

Gulf Research and Development Company, which spent around $750,000 in geological and geophysical investigation in Alberta from 1941 to 1946, probably will double that six-year expenditure in 1947. During the past few months the company has boosted its stake in Alberta to upwards of 3 million acres, bulk of this on the north and south extensions of the Leduc region play. It has initiated its first drilling in Canada, a two-mile-plus venture at Pincher Creek in the South Alberta Foothills, where Gulf has been carrying out geological and geophysical work since 1941. Its second venture was to spud in August, on the Stony Plain Indian reserve, nine miles northwest of the Leduc field. Speeding its geophysical program, Gulf has put to work an Aerial Magnetometer and two Seismographs (all working double shifts) and two Gravitymeters. Gulf also has a stake in the Muskeg operation.

Sandard Oil Company of California, the most active and most successful explorer on the Southern Alberta Plains between 1941 and 1945, curtailed operations in 1946 (nevertheless sharing with independents in that year in the oil discovery at South Princess). In 1947, the company is again a leading factor in exploration, with operations spread over more than 3 million acres on the Central in addition to the Southern Plains. California-Standard has stepped into the south extension of the Leduc region play with acquisition of 400,000 acres near Red Deer, now being seismographed. It has started structure test drilling on nearly 1 million acres in the Castor - Coronation region, has completed structure test drilling, and has started deep drilling on extensive holdings south of the Medicine Hat gas field in southeast Alberta. It has started deep drilling (through Devonian and Cambrian) at Princess, where it developed a large gas reserve and some Madison and Devonian oil production, and is participating with independents in followup drilling of the 1946 South Princess Madison lime oil discovery. At West Taber, a Lower Cretaceous oil pool discovered by Standard in 1944, the company completed a 175-barrel flowing well in April, and is following up with further drilling.

During the first six months of 1947, California - Standard produced 179,000 barrels ofoil in southern Alberta, boosting cumulative yield to over 1,327,000 barrels. Of this about 492,000 barrels has come from seven wells at East Taber, over 187,000 barrels from eight wells at West Taber, over 458,000 barrels from 16 wells at Conrad, and over 189,000 barrels from the Princess area. Standard was responsible for discovery of all these fields.

Shell Oil Company of Canada has extended its 1947 program to New Brunswick, where it has acquired rights to 3 million acres, and will carry out extensive geological and geophysical operations. In Western Canada, where Shell has been a leading operator particularly in the Alberta Foothills, the company has restricted 1947 operations. Currently Shell is making a try for the Devonian (looked for below 12,000 feet) at Jumping Pound, where the company made a Madison lime wet gas discovery in 1944, and has since established a reserve variously etimated at 500 to 1000 billion cubic feet. Shell is also participating in the million-dollar Muskeg operation, and has retained fairly extensive holdings on the South Alberta Plains east of Turner Valley and in the Hanna area.

British American Oil Company and Omnitrans Corporation (an independent) will commence a wildcat shortly on Shell's Hanna acreage, with Shell receiving a 25 percent net interest in any production. This will be a Devonian test, on a line between the two current Devonian oil sources on the Plains (Leduc and Princess). British American, which wasn't active in exploration in 1946, has also recently bought in and is participating in development of close-in acreage at Leduc and South Princess.

Socony - Vacuum Exploration Company provided evidence in recent weeks that it, too, will greatly expand its 1947 operations in Alberta. The company has been engaged in geological and geophysical operations in the Foothills for several years, and early in 1947 started on its initial Western drilling with a stake in the Muskeg venture. Early in July, the company moved into the Hanna-Drumheller area, between Leduc and Princess, with a string of reservations totaling about 1 million acres. Exploration plans for the new holdings are expected to be announced shortly.

Creole's

VENEZUELA INDOCTRINATION SCHOOL

By GEORGE O. IVES
Staff Writer

AMONG the many problems facing some of the major world oil units in their operation of fields in foreign countries is that of keeping foreign operating branches staffed with the proper type of expatriate personnel. A company does not succeed indefinitely in any foreign area on the strength of its technical ability alone. One of the primary factors is the company's success in maintaining the proper relationship with the foreign government's nationals, from those on governmental administrative levels down through the entire social structure. Companies have come to realize that each expatriate employe, regardless of the nature of his job, is a representative of his company within his sphere of contacts, and has a certain responsibility for promoting industrial and public relations.

At the time employes are hired for foreign assignments an attempt is made to obtain those who have the proper qualifications for their contacts with nationals. But it is not always possible for an employment interviewer, perhaps not completely familiar with all job requirements, to get enough information to satisfy himself fully as to the prospective worker's probable chances of success on the job.

Expatriates Employed

Expatriates are hired for a dual purpose. They are needed to supervise operations or to do specialized work for which qualified nationals are not available, and they also have the responsibility of training and developing nationals in accordance with the policy of using nationals wherever possible in carrying on operations. Such expatriates should be experts in their line of work, capable of holding their own among keen competition at home, but should also bring additional assets to the job. They should be prepared through training or experience to develop national employes under their direction, and should be temperamentally suited for such an assignment. One of the most important factors is that they should be able to transmit their knowledge to the national workers in the workers' native language.

Creole Petroleum Corporation, with expanding operations in Venezuela, and faced with the problem of fitting new employes into the organization as well as reintroducing personnel returning from war service, has solved its problem by establishment, nearly two years ago, of a formal indoctrination school at Maracaibo, Venezuela. Here, in a course of eight weeks duration, new and returning employes are given a working knowledge of the Spanish language, as well as basic information concerning the laws and customs of the country, and operating policies of the company . . . basic knowledge needed to do a supervisory job in Venezuela.

Eight-Week Courses

Classes are so arranged that a new group of approximately ten students starts every two weeks. The basic program requires eight weeks. Five hours a day, five days a week, or a total of 200 hours, are devoted to Spanish instruction. Two hours a day throughout the program, or a total of 80 hours, are devoted to the supplementary material. Four of the Saturdays are used in cutting phonograph records to test and record in permanent objective form the progress each student has made in Spanish, and the other four Saturdays are used in making field trips to the Lake Maracaibo area oil fields, and the industries, public works and surroundings of Maracaibo. The supplementary material period of two hours daily is participated in by the entire school, which is brought together for discussions. During the training course the employes are assured of an overall picture of the company and its operations and the company is given an opportunity to weed out or reclassify employes before final placement.

The school is housed in two buildings equipped with eight small classrooms for a maximum of ten men each and one lecture hall capable of seating 65 persons, the maximum number expected to be enrolled at any one time. The students live in groups of six, plus one or two Spanish instructors, in special

Students in Creole's indoctrination school are quartered in special apartment houses in small groups, together with instructors, so that practice and assistance in Spanish may be had at all times.

apartment houses. The apartments and the school itself are located in the old hospital camp about a quarter mile from the company's terminal, and transportation is provided so that established camp facilities may be used for meals.

Since it was desirable that the students be in a Spanish atmosphere for 24 hours a day during training periods, and that company experts be available for lectures on operations and policies, the school was located in Venezuela. Maracaibo was chosen for its existing facilities at company camps, plus its proximity to oil fields, permitting inspection field trips and opportunities to make frequent contacts with local theatres, markets, stores, and social events make a more gradual transition from U. S. home life to oil field life in a foreign country.

In view of the length of the program and the cost involved, it was necessary for the company to set up a series of tests and safeguards to screen personnel . . . to see that no one takes the program who by previous training has already been qualified, and that no one escapes the program who should be included. It was necessary to see that employes who already had an advanced knowledge of Spanish are placed at proper levels in the program, and that all are making reasonable progress. Instructors must also be checked to see that the high standard of instruction is maintained. Provision must also be made for repeating instruction if individuals need more time and their positions with the company warrant it. Objective tests of various kinds, instructor and student ratings, a tutoring system, screening committee and certain supervisory and personality tests have all been set up to accomplish the desired ends.

Teaching Method

The company has adopted a teaching method for Spanish which embodies features of several of the more widely used systems such as Berlitz, and that used by the U. S. Armed Forces Institute. In addition, local words and expressions peculiar to the locality and the industry are added. It was found in analysis of the material covered by the Armed Forces Institute in the first 60 hours of work, that in the same time the members of the Creole program had covered the same amount and had added numerous grammatical forms and idiomatic expressions. Vocabularies of the two methods are approximately the same size, but Creole's method includes different content more suitable for the particular need.

The method calls for the student to spend 1¼ hours in the classroom with a Venezuelan instructor, the teaching material having been prepared for instructors who have no knowledge of English. During this time the class may include as many as 12 men, and the class is given new material during these periods. Immediately following, an equal period of time is spent with a drillmaster working with no more than six men, who gives no new material, but simply repeats, and forces the men to use, practice, and repeat what has already been presented. The two periods are then repeated in the afternoon. It has been found that at the end of eight weeks the students have a workable knowledge of the language, adequate for their daily life and sufficient for establishment of social and business relationships with the Spanish-speaking people of the country. It is estimated that their vocabularies consist of approximately 2000 words, not including verbs and auxiliary words, and not including the expressions picked up outside the classroom during contacts in the camp, cities, clubs, shops, etc. It is believed that the students are more at home in the language after these eight weeks than they would be normally after studying and living two years in the country.

Learning by Phonograph

Since the emphasis on training is in learning to use and understand the spoken word, a measure of progress must be obtained some other way than in the usual written quiz. Records have been made for playing on a phonograph, consisting of a series of questions covering a given unit of work. The student hears the record and must immediately reply verbally to all questions. The original questions and the student's answers are recorded on another phonograph disc, and immediately after the examination he can hear his own record played back. He therefore learns to hear and recognize his own mistakes, and learns more readily to correct errors in pronunciation than is possible by any other known method.

The program of Spanish instruction has been so successful that the company has started making the method available to all presently employed expatriates who do not already have a command of Spanish equivalent to that achieved through the school. It feels that any employe is more valuable and commands greater respect from the nationals when he becomes fluent in the nationals' own tongue.

Although the greater part of the time is consumed with learning the language, the supplementary subjects covered during the indoctrination course are also considered vastly important. The classes are addressed by company officials and other responsible authorities on a wide variety of subjects designed to give them closer touch with the country, and to make them more comfortable and happy through a knowledge of the background, history, customs and beliefs of the people among whom they are to work. They also get primary training in labor laws as well as land and civil laws, and are briefed in how to conduct themselves as a credit to their organization.

Informal Discussions

The formal presentation of the subject is generally limited to one hour. The remaining hour is given to a round table discussion during which time the student has opportunity to question the expert on phases which have the greatest interest for him and the greatest bearing on his future job. These discussion periods have been quite successful. It is found that they are entered into wholeheartedly by students and experts, and serve the double purpose of getting students personally acquainted with some 15 to 20 top management representatives.

In many jobs filled by Americans in the Venezuelan operations of the company, it is possible to get by with only a rudimentary knowledge of Spanish. This is particularly true of some jobs in principal offices where very little contact with nationals is necessary. But in the greater percentage of positions, fluency in the country's language is almost indispensable. One student, a geologist, tells of his experiences upon going to Venezuela, saying he would have been helpless for many months as far as efficient operation of his job is concerned. As a geologist he was constantly stationed in back-country areas with a large crew of helpers, none of whom understood anything but Spanish.

Another man was a specialist in industrial relations. This type of work simply could not have been possible for him without a fluent use of Spanish. He feels that the eight weeks in the indoctrination school were of more benefit than he could have received from three years of college.

For the most part the students show remarkably keen insight into the aims behind the company's program, and realize that an American in a responsible job with no knowledge of the language, customs, laws, policies and relationships in a foreign country, is a definite, and sometimes dangerous, liability to his company.

Japan's PRODUCTION DECLINE

JAPANESE oil production for the 1946-47 fiscal year dropped to the lowest point since 1904, according to General MacArthur. During the most recent period production amounted to only 1,322,441 barrels, 250,000 barrels less than the program called for, and 160,137 barrels less than the 1,482,578 barrels produced during the 1945-46 fiscal year.

Several factors have been cited as the reason for production declines, among which are labor unrest, power shortages, financial uncertainties and the failure of the exploration program. The exploratory work in recent years has failed to add sufficiently to proved reserve to halt a steady drain resulting in a present position where Japan's proved and developed petroleum reserve is now slightly more than 15 million barrels. Since 1874 the country has accounted for a production of something like 90 million barrels, so from what has been produced and what is now in sight, the country will account for a possible total output in the neighborhood of 105 million barrels. However, results of a study just completed by the American Military Government indicate a possibility that important new territories now unexplored, and possible deeper pays may yet develop new resources.

In northwestern Honshu studies of the sedimentary basins from which the Niigata and Akita oil fields produce give rise to estimates that possible reserves in the producing districts along the northwest shore may be as much as 88 million barrels, plus an additional unestimated amount which may some day come from the basal Miocene formations beneath the present producing zones.

Although the yield from the Neocent horizons in central Hokkaido fields is virtually non-commercial, no tests have been made of Paleocene and Cretaceous horizons, which are oil-bearing in outcrop. Should these older formations prove to be productive, larger fields than any yet found in Japan could result because of the more favorable structural conditions which appear to exist in north-central Hokkaido.

Little attention has been given to prospects in other sedimentary basins. Oil seepages are known in eastern Hokkaido, where a large, poorly-mapped Tertiary basin exists. There also are Tertiary embayments on the Pacific Coast of Honshu which warrant further investigation.

From the standpoint of the American operator, Japan is still in the dark ages of petroleum exploration. The AMG experts found the application of geological science more backward technologically than was expected. A real geological mapping in the producing basins is incomplete and unreliable. Geophysical methods have been applied only on a small scale and only during the last three years to extensive and significant alluvial areas. Regional subsurface studies have not been attempted and the application of micro-paleontology to regional correlation has not passed the basic research stage.

Early Production

Japan probably was one of the first countries to have commercial oil production, it was indicated by research into the history of the industry.

Twelve centuries ago the Japanese knew the burning qualities of petroleum and asphalt, and in the early 13th century production started as a commercial enterprise when rights to sink hand-dug wells were granted to individuals of Kurokawa, Echigo province, in Niigata Prefecture. The first Japanese oil company, however, was formed at Nagano in 1871. A number of dug and hand-drilled wells proved unproductive and the company imported a drilling rig from America. The first power-operated test was drilled in 1873, and was unsuccessful.

In 1888, the Nippon oil company was established, and in 1890 American cable-tool equipment and drillers were imported. By 1894 effects of the first modern exploitation methods were reflected in a production increase. Rotary drilling equipment from the U. S. was introduced in 1912, resulting in a marked increase in production during the next few years. Japan's all-time peak output was from 1915 to 1917 when yearly production ranged between 2,830,500 and 2,956,300 barrels.

A study of the records of the Ministry of Commerce and Industry shows there are 76 oil fields in Japan, nearly one-half of which are abandoned or produce an insignificant amount of oil. No field has a proved area exceeding 1000 acres or an estimated ultimate production exceeding 18 million barrels. The combined acreage of all fields is 11,455 acres, and of an estimated ultimate total recovery of 105,411,000 barrels, 80 percent will be derived from ten fields.

Because of underground conditions which in many cases make for relatively small pockets of oil and also because of the drilling methods followed until comparatively recent years, drilling density has been abnormally high, ranging in the principal fields from five wells per acre in Niitsu to one well per 3.3 acres in the Atsuma area of Hokkaido. A total of 10,272 wells have been drilled in all fields, giving an overall average of 1.1 wells per proved acre.

Little is known of the reservoir conditions in any of the producing fields, the AMG study disclosed. Probably little or no attention has been given to gas-oil ratios and conservation of gas in the early development of the fields. Most fields appear to be of the gas-depletion type, although there is evidence the Ishinazaka field is under a strong water drive. The close spacing of wells can be attributed partly to lack of knowledge of subsurface conditions and partly to attempts to secure additional oil from depletion-type fields in which the initial gas pressure had not been used effectively.

A marked contrast exists between recovery of oil per acre in Hokkaido and the districts of northern Honshu. In Hokkaido, recovery per acre has been uniformly far below that which would normally be regarded as commercial. An average recovery of 875 barrels of oil per acre is indicated, and in Ishikari, the most prolific field, the recovery amounts to 1740 barrels per acre.

In northern Honshu the overall average indicated recovery is approximately 10,000 barrels per proved acre, a figure regarded as economically marginal by normal standards. Recoveries exceed this figure in eight fields, and in the Kurokawa, Innai, Niitsu and Ishinazaka fields recoveries range between 25,000 and 35,000 barrels per proved acre, comparing favorably with recoveries from fields of similar depth that are commercially successful in other countries.

A field-by-field survey showed that less than 1 percent of the wells are flowing. Gas lift and other stimulating methods for prolonging the producing life of wells are not used.

Almost all wells are pumped from

central power (jack plants), and few are equipped with individual pumping units. Wholly integrated well-pulling machines are used in some fields, but many operate with antiquated methods. Common cup-type and spiral wrapped plunger pumps are used in more than 95 percent of the wells.. Infiltration of sand and water causes considerable pump trouble, and on an average pumps have to be removed more than once a month.

Important Areas

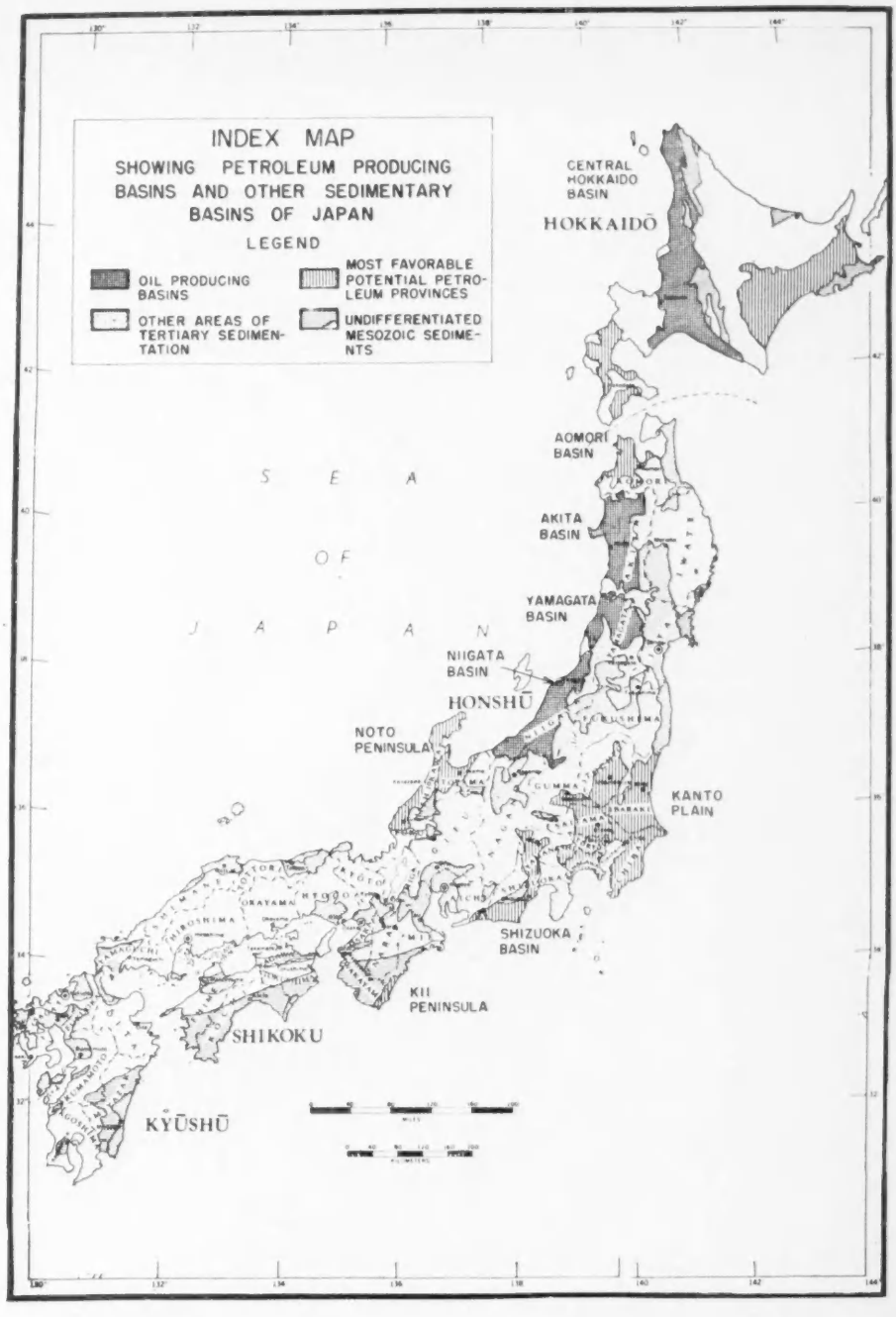
Five areas of special interest were discussed in some detail in the report, as follows:

Hokkaido district—Drilling is contemplated only in Koetoi field. About 14 locations which remain undrilled probably will not yield sufficient return for the outlay involved. Prospects of Cretaceous production in the Kitami district warrant further investigation.

Akita district—Hachimori, the northernmost field and most recent discovery in this district, has the second largest production in Japan. The limits of this field are not fully defined. Production is from fractured shales and tuff near the base of the Funakawa formation. The lower Miocene section remains untested. Development and operation of this field are the most modern and efficient in Japan.

Kurokawa is an important field because the oil recovery per acre has been the highest of the Japanese fields and because this production comes from the lower Nanakura tuff near the base of the Miocene. The lower Nanakura tuff has rarely been tested in other fields. A well drilled in 1914 is reported to have produced 10,000 barrels a day, the largest in Japan.

Yabase, south of Kurokawa field on the same structural trend, is now the most important field in Japan. It produces about 35 percent of total production and contains 40 percent of the proved oil reserves of Japan. The limits of this field are not fully determined. The Yabase structure is a gentle anticline with a larger gathering area than most structures in the Akita district. The Yabase field has nine producing zones: the upper zone in the Sasaoka formation is found at a depth of 90 meters; the oil zones in the Katsurane formation are found at 190,245,335 and 365 meters; the lowest zone in the Katsurane formation is at the contact between it and the Kunakawa formations, the latter having two producing zones at 400 and 750 meters; and the deep zone near the top of the Onnagawa is about 1000 meters in depth. The prolific lower Nanakura horizon of Kurokawa has still to be explored. Many wells, particularly in the Katsurane, formation, produce from more than one well.



Yamagata district—Innai, including the Okuoguni field, is the third largest producing district in Japan. While present horizons are 90 percent depleted, deeper possibilities in the Onnagawa and lower Nanakura tuffs remain untested.

Katsurazaka, south of Okuoguni, is under development and has possibilities of deeper oil production. The structure is imperfectly known.

Kamihama is under development. The structure is not yet understood, but accumulation is controlled in part by an unconformity.

Chokaizan is notable because it is on the flank of the extinct volcano of that name. It produces only a small amount of ten-gravity oil from fractured volcanics and the Funakawa formation.

Ishinazaka, also called Shonai, was discovered in 1944 and has 16 producing wells and one exploratory drilling well. It is unusual because of high per acre recovery from the upper Pliocene formation. The field limits have not been defined except on the eastern side where a normal fault, against which the structure closes, has been definitely located. Production is under full hydrostatic control. Other faults parallel to the Ishinazaka fault have been mapped on the surface and by geophysical surveys. Excellent possibilities exist in this area for the discovery of further accumulation controlled by fault closures.

Niigata district—This district, sometimes referred to as Kashiwazaki, before the discovery of Yabase in 1935 was the important oil-producing district.

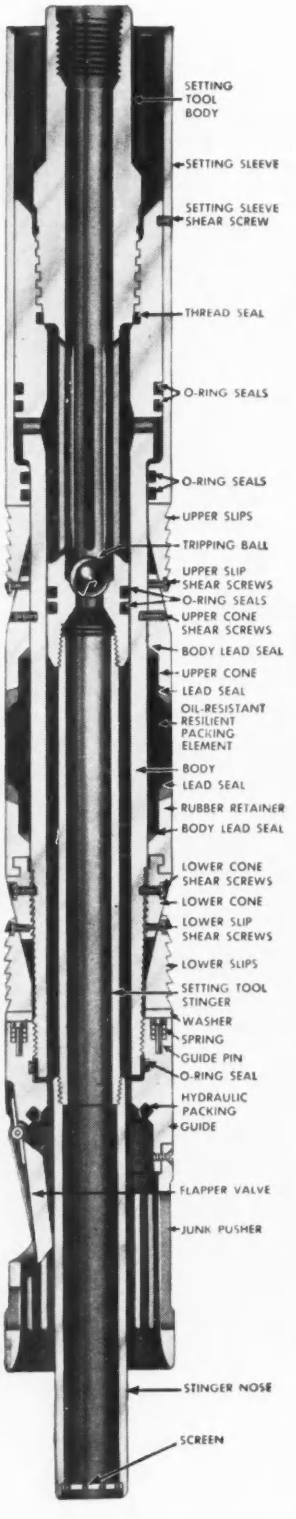
Baker Retainer Production Packer

The isolation of a zone adjacent to a liner, or a string of casing, by means of a safe, easily operated packing device has been a problem confronting the petroleum industry for a long time. There is now available a packer which has proved completely successful for both single-zone and multiple-zone production; for segregated gas injection; for the protection of casing from the effects of pressure or deleterious fluids; for selective acidizing, and/or testing, especially just prior to dual completion; for safety in completion of high-pressure wells, leaving mud in the annulus if so desired; and other similar or related applications.

The Baker Model "D" Retainer Production Packer, together with accessory equipment, is not of the "Retrievable Type" but is permanently set to become virtually a *part of the casing* and *not* part of the tubing. It provides *all* of the following advantages . . .

COMPLETE DRILLABILITY—The entire assembly is made of materials which can be readily drilled up, if necessary. Not so long ago one company had a packer of another type stick, and twenty-two days work was required to get the packer out of the well. Another operator, who had painful experience with other packers, standardized on the Baker Retainer Production Packer, remarking, "It is much easier to drill them than to mill them."

THEY HOLD BOTH WAYS—The Baker Production Packer is anchored against either *upward* or *downward* movement by two full sets of opposing slips. This feature always is desirable, and is vital in gas-injection or water-injection wells where constant pulsation is present. Many of the leading operators are moving their secondary recovery departments into newly developed fields to start repressuring, re-cycling and water-injection programs, and find the Baker Retainer Production Packer ideally suited to such work.



Baker Model "D" Retainer Production Packer Product No. 415-D with Setting Tool in Position

CORROSION RESISTANCE—The cast iron construction of these packers is far more resistant to corrosion than the steel casing in which the packer is set. In one important field 82 Baker Retainer Production Packers were set in wells containing hydrogen sulphide-bearing gas which had developed casing leaks in a number of wells. Packers were set above the producing zone to confine production to the tubing and isolate the casing from the destructive gas. After 5 years one packer was replaced, and then only because it was necessary to re-work the well.

FREE FROM TUBING—The tubing string is independent of a Baker Retainer Production Packer, and it usually is possible to pull the tubing easily whenever desired. This is an important advantage which requires no explanation.

NO "SET-DOWN" WEIGHT IS REQUIRED—When it is desirable, the tubing can be suspended in tension so that pressure bombs (and other devices) can be dropped readily through the tubing. There is never the hazard and inconvenience due to "corkscrewed" tubing, often resulting when set-down weight is applied to conventional type packers.

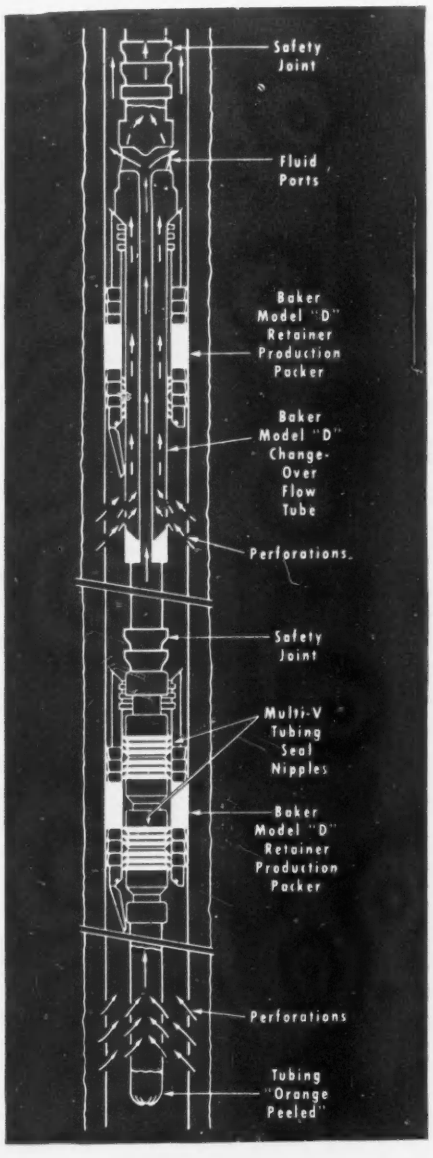
ADAPTABLE TO *ALL* WELL CONDITIONS—Baker Retainer Production Packers are adaptable to two-zone production, water-injection or flooding, re-pressuring, re-cycling, testing, acidizing, gas lift, and many other difficult as well as routine operations.

SIMPLE, POSITIVE SETTING

After running-in the Baker Retainer Production Packer (with Setting Tool inserted) to the desired depth, the Tripping Ball is dropped and seated to prevent further passage of fluid through the Packer. Sufficient hydraulic pressure is then built up to shear a set screw and

Solves Many Difficult Problems

permit the Setting Sleeve to move downward and set the upper slips against the casing. While maintaining hydraulic pressure, an upward strain is taken to set the lower slips and expand the packing element against the casing. By using



Two-Zone Completion Hook-up with two Baker Retainer Production Packers and accessory equipment, here used to pump or flow an upper zone through the tubing, and to flow a lower zone through the annulus between the tubing and the casting.

HYCAR for construction of the packing element, a permanent seal is maintained for a long period of time, regardless of the type of fluid present in the well.

When the Setting Tool is removed, the Flapper Valve seats and closes off the lower formation. The Packer is now permanently set, and the tubing as well as any tools, can be run through it.

OPERATING THROUGH AND BELOW PACKER

Due to the full opening through the Baker Retainer Production Packer, and the integral back-pressure valve, practically all necessary operations can be carried out without interference or delay. There is no necessity for pulling rods and/or tubing under pressure; it is ideal for gas lift wells where the tubing must be pulled at more or less regular intervals for valve repair or replacement; there is no interference with tubing gun perforators, suction bailers, acid jet guns or gas anchors; and the tubing always can be run back through the Packer after any operations have been completed.

The well can be plugged back with cement to a new bottom through the Packer, which can also be converted to a casing bridge plug, or used like a cement retainer for squeeze cementing. The Packer can be used for making a flow test with production through tubing run through the Packer; or, if the tested zone is not productive, it can be squeeze-cemented through the Packer.

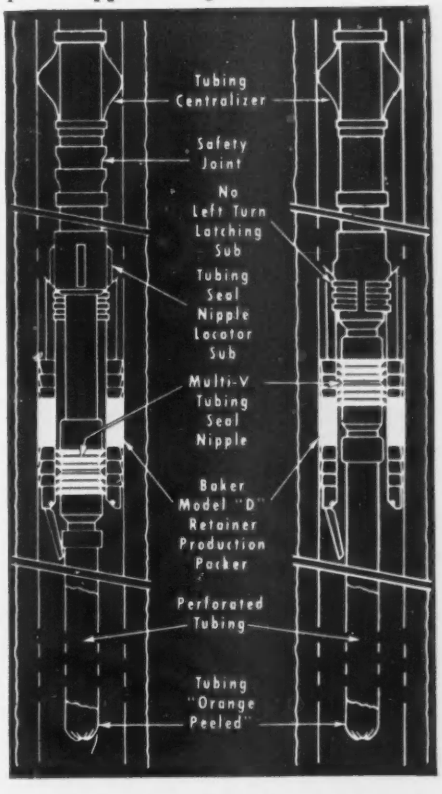
SINGLE-ZONE AND MULTIPLE-ZONE PRODUCTION

The Baker Retainer Production Packer is used with single zones for many purposes. It will prevent gas from cutting holes in the casing (often initiated by thread leaks) by transferring the pressure from the casing to the tubing. If and when the tubing leaks it can be pulled from the well, repaired and replaced through the Packer. The Packer will protect the casing when corrosive fluid is being produced or injected, by allowing the annulus to be filled with oil and confining the corrosive action to the tubing.

One Packer provides for production of two zones, either simultaneously with segregated production, or from each zone separately at different times; for three-zone production only two Packers are required. With a single Packer oil may be produced from one zone and gas from another; gas may be injected into one or two zones, or gas may be injected into one zone while producing oil from another.

SPECIFIC RECOMMENDATIONS AVAILABLE

Complete descriptions and illustrations of the Baker Model "D" Retainer Production Packer are in the Baker 1947 Catalog, gladly sent upon request; also in the 1947 Composite Catalog. Inquiries directed to Baker Oil Tools, Inc., at 6023 Navigation Blvd., Houston, Texas, or Box 2274, Terminal Annex, Los Angeles 54, California, will enable us to furnish specific recommendations to solve your packer application problems.



Using a single Packer, with accessory equipment indicated, in two-zone production hook-ups. The flexibility of the Baker Model "D" Retainer Production Packer (used with proper accessory equipment) makes it possible to accomplish the important results described in this article.

BAKER OIL TOOLS, INC.
Houston · Los Angeles
New York

Many of the large fields in this district are nearly depleted. New fields have been found in recent years in the northern part of the district, and an alluvial basin 80 miles long is still unexplored.

Kurokawa, sometimes called Echigo-Kurokawa to distinguish it from the important field in Akita district, was discovered in 1941, but shows no indication of becoming an important reserve. Oil is produced from upper Pliocene horizons and is apparently trapped unconformably below a Quaternary cover. Shibata, discovered in February, 1945, is the newest field in Japan. The accumulation appears to be controlled by an unconformity. A test drilled to the Takayanagi formation proved it to be barren.

Niitsu is one of the oldest fields in Japan and the largest in total oil production. Production is from fault blocks on the nose of a large plunging anticline, but subsurface conditions are imperfectly known.

Miyasawa and Nishiyama are comparatively gentle anticlines with flanks dipping at 20 to 30 degrees. The oil production from these structures is second to that from the Niitsu field. Gear-bearing sands are under development. Deep horizons have not been fully explored.

Higashiyama produces from a gentle anticlinal-structure in which the Shiiya formation is exposed at the surface. It is notable for its oil mining operations which started in 1939.

Shizuoka district—In the Sagara area about 50 seepages of natural gas or petroleum are found in formations of Miocene age and in alluvium presumably overlying those formations. These Miocene formations trending structurally northeast are closely folded and often crushed and faulted. Insignificant production of petroleum has been obtained for many years from crushed and faulted shales on the steeply dipping flanks of the Megami anticline. Natural gas was recently produced at Hatsukura. A thick section of Pliocene rocks unconformably overlying the Miocene occupies a down-warped basin in the western part of the area. Further investigation of the structural relationship is necessary to determine whether economic accumulations of petroleum are possible in this area.

The AMG study outlined possible oil-bearing areas far larger than all the fields discovered in the past. The most favorable areas are in eastern Hokkaido, the Aomori basin of northern Honshu, the Noto Peninsula, Kanto Plain, Shizuoka Basin. Undifferentiated Mesozoic sediments are found in four areas on Hokkaido, the Kii Peninsula, Shikoku and Kyushu, and other areas of Tertiary sedimentation are scattered through the islands. There also may be prospects of offshore production along the sea coast.

Potential Reserves

Surveying the potential reserves of the country, the report carried the following notes:

Producing horizons of northwestern Honshu:

The crests of the structurally more favorable anticlines which are exposed at the surface have been explored for the most part down to the Funakawa or Teradomari formations, although a few such structures remain to be tested. Oil also may be found in secondary traps on flanks or noses of such structures. The main prospects remaining are hidden structures in alluvial basins; stratigraphic traps developed by unconformity or overlap (such prospects are mainly around the margins of the alluvial basins); basal Miocene horizons in many structures in which these horizons have not been tested; the incompletely mapped marginal areas of the main basins where sources rocks are still represented covered by gently folded younger sediments (the eastern limits of these conditions are still imperfectly known).

Upper Pliocene—Economic production has been found in these beds, despite the fact they are generally confined to synclinal or alluvial areas.

Katsurane and Shiiya formations—The Katsurane formation or its equivalent, the Shiiya formation, contain the principal porous reservoir rocks of the petroliferous Tertiary. Many of the most obvious structures, where these formations are exposed on the crests of anticlines, have been tested. Other structures of similar type probably will be found in alluvial areas. Since these formations thin out and are sometimes missing owing to unconformity or overlap, possibilities of stratigraphic traps should be considered. Regional subsurface study of the distribution and variation in lithology of these formations is recommended.

Funakawa and Teradomari formations—The Funakawa formation and its equivalent, the Teradomari, usually contain an insufficient thickness of reservoir rock for commercial oil production. Porous layers of sufficient thickness to yield profitable oil production may be found locally at shallow depths. The thin productive streaks in this formation should be looked upon only as secondary objectives in wells drilled for the purpose of testing deeper horizons.

Basal horizons—The Kurokawa field has yielded the largest wells of any field in Japan and has shown that good commercial production can be obtained in the basal beds of the series, although the lithologic conditions encountered in that field are not universal. There is no reason to believe that similar results cannot be duplicated elsewhere in the basal horizons since many untested structures are known where such production may be found. Only by drilling can existence of productive horizons in these layers in any given structure be determined.

Hokkaido Central Basin—No figure can be given for the potential oil reserves of Hokkaido. The existing fields in the central basin cover only a small fraction of this large Tertiary area much of which has not been mapped in detail. The existing fields show the low average production of 875 barrels per proved acre. Most of the test drilling has been in the vicinity of the fields; few test wells have been drilled deeper than the Masuporo formation. No record has been obtained of any wells that have penetrated the Cretaceous which in some places is oil-bearing in outcrops. Although it remains to be demonstrated by exploration that this basin contains petroleum reserves of economic significance, the area contains structures which could offer wide possibilities if commercial production should be found in lower horizons.

To develop these potentialities, however, Japanese techniques will have to be revised and brought up to date, it is indicated. Oil geology in Japan is only now emerging from the 1920-30 viewpoint. Drilling techniques are better because of the fact that direct contact with American operations before 1941 was largely limited to visitors interested in equipment and drilling methods. Efforts now are being made to develop a scientific organization based on modern methods of areal mapping and geophysical prospecting.

"Increases in reserves in other countries which have resulted from geophysical exploration, modern subsurface techniques, and drilling in sedimentary basins and on structures lacking more obvious indications of oil at the surface lead to the conclusion that, since there undoubtedly remain considerable territories both within and outside the present oil-producing districts of Japan that are suitable for the application of such methods, the country's oil potentialities are not exhausted," the AMG team reported.

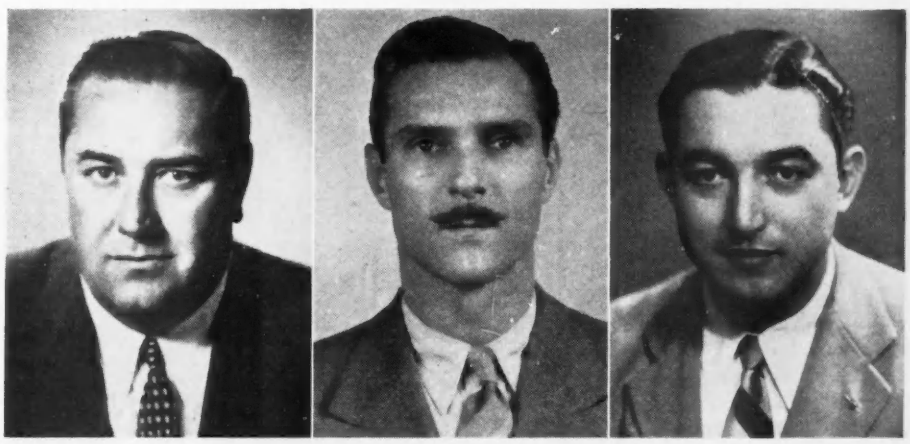
"Nothing in the past record of oil development in Japan suggests that new fields will be particularly prolific in character, although the possibility of discovery of more prolific types of fields cannot be excluded. It is probable that new fields found and their rate of discovery will continue to be unspectacular, but will enable the oil-producing industry to continue in Japan for many years."

Turkey's EXPLORATION PROGRAM

By HENRY OZANNE

TURKEY'S new oil well drilling program will get underway in a month, according to a schedule drawn up in New York by representatives of the Turkish government and Drilling and Exploration Company, Inc., of Dallas, American contractors for the enterprise. Details of Turkey's intensified search for oil were disclosed by I. R. Berent, general director of mining research and exploration for Maden Tetkik ve Arama Enstitusu (M. T. A.) of Ankara; Turgut Ulug, petroleum engineer for M. T. A., and Edgar H. Clayton, vice president of Drilling and Exploration, who recently has been stationed in Ankara.

Drilling and Exploration Company is shipping from New York immediately four rigs and drilling crews totalling 16 men. Turkish nationals also have been mobilized in Turkey to work with the American drillers. Two of the rigs will go on coal coring in the Black Sea area, while the other two will be used for oil well drilling in southeast and south central Turkey. First tests will be made in the Mardin area, north of the town of Mardin, and about 50 miles from the Syrian border. Then the rigs will be moved to the Adana Basin, on the northeast end of the Mediterranean Sea. Tests will start around Adana the latter part of this year, according to present plans.



I. R. Berent E. H. Clayton Turgut Ulug

Well depths of about 5000 feet are expected in the Mardin area, and of slightly more than 6000 feet in the Adana Basin. Formations in both these

Areas 1, 2, 3, and 4 are sectors which already have been explored by M.T.A. United Geophysical Company is still working Areas 1 and 2. Area 1 is the site of the stepped-up drilling program that will get under way in September.

regions are Eocene limestone, known locally as Midyat formation. United Geophysical Company, which has been working with M. T. A. for more than a year, is continuing survey projects in both the Adana Basin and the Mardin areas. Exploration has been carried on in the Mardin sector since 1933, during which time M. T. A. has made use of the technical service of more than 2500 Europeans and Americans in addition to its own staff. The Adana Basin was the second area explored, while geological work also has been done in Thrace and in the Erzurun area, the latter region in the eastern part of Turkey, below the Black Sea, being the newest to be explored. Some geophysical work has been completed around Mardin and in the Adana Basin, chiefly by a French company.

Oil well drilling was begun in Turkey in 1933 near Mardin, where about half a dozen wells have been completed to date. Of these, one is a small producer of about 50 barrels daily, the only production anywhere in Turkey. Gas has been found in the Adana Basin and in Thrace.

It has been noted that the famed Kirkuk structure in Iraq slopes in a long narrow northwest direction, and if carried far enough would break into Turkey's Mardin region.

All petroleum work in Turkey is government monopoly, no "mixed" companies being allowed yet. The oil program is directed by M. T. A., which acts as the government's agency. Petroleum activity in Turkey dates back to 1926 with the organization of the government's Petroleum Exploration and Development Bureau. The M. T. A. institute was created in 1935 and conducts both research and exploration work together.

M. T. A.'s petroleum division during the last 12 years has drilled a total footage of 180,000, of which one third has been for oil exploration and the rest for various other purposes. By the end of last year 171 Turkish students had been sent by the Institute to Europe and the U. S. for technical education. The Institute's petroleum geology department does geological and geophysical work on all probable locations and advises the drilling department. Drilling and Exploration Company and United Geophysical are the only two American firms currently employed in Turkey's expanded search for oil. Max Thornburg, formerly petroleum adviser to the State Department, has been in Turkey this year on a survey mission for the Twentieth Century Fund. It is understood that his work has not been exclusively concerned with petroleum, and that, as far as can be learned from Turkish authorities, no change is now contemplated in Turkey's petroleum law.

Oil Production in British-Occupied Zone of Germany Records Increase

Oil production in the British-occupied zone of Germany showed an increase in May, the total of 353,119 barrels comparing with 329,118 barrels during April and 296,077 barrels in March. During May about 77,000 barrels were produced by foreign concerns, Vacuum Oil Company accounting for 37,000 barrels with the remainder produced by D.A.P.G. and Shell. The German companies Preussag, Braunschweig and Schachtbau-Reichswerke together produced 41,958 barrels, the Gewerkschaft Elwerath 162,927 barrels, the Deutsche Erdol AG 69,930 barrels, Wintershall 66,433 barrels, Itag 3497 barrels and Deutag 2797 barrels.

D.A.P.G. and Shell together own 40 percent of the Fuhrberg field, which accounted for 26,315 barrels in May, and jointly own the Rodewald-Steimbke field, which produced 26,860 barrels. The same two operators and Vacuum hold a 49 percent interest in the Thoeren field and Vacuum Oil Company has a 49 percent interest in the Reitbrook-Bergedorf field which produced 21,888 barrels during May. This company owns the Haenigsen field and the Handemstorf field which together produced 22,147 barrels, the latter area having increased to 4427 barrels from the previous month's 1182 barrels through new production. Production from Emsland wells increased from 45,329 barrels in January to 69,371 barrels in May, although the overall production from the whole British zone is nearly 70,000 barrels monthly less than 1946 production.

Production in northwestern Germany for June was 343,000 barrels, bringing the total for the first half of the year to 1,903,851 barrels. The output is still reportedly affected by the shortage of steel and tires.

Refineries generally are operating normally. The Leuna Works at Merseburg are again producing gasoline at a rate of 85,000 barrels a month along with an additional 36,000 barrels of diesel oil. Production was switched to synthetic fertilizers a few months ago.

Several wells are now being drilled in the Meinersen-Almsen area of Lower Saxony in the British zone. Wildcatting also is scheduled for the district of Bassum, about 20 miles south of Bremen, within the next few month. The schedule calls for wells to a depth of 6500 feet.

From the French zone it is reported that greater attention is to be given treatment of oil shale deposits in southern Wurttemberg for the production of gasoline.

In the American zone the Bavarian Minister of Economics has announced an extensive program of exploratory drilling. This will include renewed exploration of the Tegernsee area between Munich and the Austrian Tyrol where small production was obtained by the Germans in complex Tertiary sediments in front of the northern Alpine overthrusts. Other wells will be drilled in the vicinity of Bad Tolz, several miles northwest of Tegernsee. The Deutsche Erdol A.G., one of the largest oil organizations in prewar Germany, is reported to have resumed drilling in the Kirchoichel area, south of Dietramzell.

Deepest New Guinea Well Drills Below 8488 Feet

Australian Petroleum Company's test at Kariava, 70 miles up the Vailala River on the southern coast of Papau, New Guinea, had reached 8488 feet on July 1, and preparations were being made to run approximately 8300 feet of 6⅝-inch casing.

This operation had reached 5000 feet in February, 1942, when the Japanese invaded the island. Drilling was resumed several months ago. No shows of oil have been reported in this well, the deepest ever drilled in Australasia.

Brazil's June Production Is 659 Barrels Over May

Brazil's production in June showed an increase of 659 barrels over the May figure, with 345 barrels of the increase accounted for by first production from the D. Joao field discovery.

Total production for June was 8331 barrels, compared with 7672 barrels in May and 7731 in April, although still below the first three months of the year. Output for the first half of the year was 50,317 barrels. Total 1946 production amounted to 67,224 barrels.

Egyptian Well Quits

Anglo-Egyptian Oilfields has abandoned its Ataka wildcat on the west side of the Suez Canal in Egypt. A depth of 3938 feet was reached. In conjunction with Socony Vacuum, the company now is drilling two wildcats on the Sinai Peninsula. A seismic survey is being undertaken in the Western Desert.

Sinclair Shipping Heavy Rig, Other Equipment for Ethiopian Exploration

Continuing the accelerated program for a thorough investigation of the oil possibilities of Ethiopia, Sinclair Petroleum Company has ready for shipment within the next few days a heavy-duty rotary drilling rig capable of going to 12,000 feet or deeper. The first site for this rig probably will be in the Diredawa area where much geological and geophysical equipment already has been delivered. This is in the southwestern portion of the country.

The company also is shipping a motorized portable drilling unit for use in water well drilling, together with two water well pumping units and material for a water purification system. This is to provide water for camp use as well as for necessary additional water for drilling operations.

Approximately 23 types of motor equipment, including everything from bulldozers and road graders to automobiles, are en route or on the ground. The completeness of the company's anticipated operations in the country is further emphasized by the purchase of a wireless telephone system for communication maintenance between headquarters at Diredawa and the field operation uits. The system has an operating radius of 500 miles.

The men at field headquarters bases will be housed in 28 tropical-type portable steel buildings which also will serve as storage warehouses. Stone crushers, concrete mixers, and other equipment is going forward to be used in road construction, and welding and machine equipment for the shops is on the way.

Field forces will be equipped with walkie-talkie radios, and rapid transport of light equipment and personnel throughout the system of operations will be furnished by a four-passenger airplane.

In July, 1945, Sinclair was granted an exploration and development concession on the entire area of Ethiopia, comprising some 224 million acres, and in the interim has been conducting some field geology and preliminary geological examination of aerial photos.

Sinclair-Panama Spuds First Test Under New Agreement

Sinclair-Panama Oil Corporation has spudded its first oil test under the new concession agreement with Panama. At a ceremony August 13, drilling machinery was started by Minister of Finance Quijano, representing President Enrique A. Jiminez. The proceedings were attended by Panamanian officials and representatives of Sinclair, and the U. S. State Department, Army and Navy.

This drilling operation gets under way just seven months after the company started its geologists and engineers working on the exploration program under the agreement of last September whereby the company obtained a grant for oil exploration on some 18 million acres in Panama.

Sinclair-Panama Oil Corporation is owned by Venezuelan Petroleum Company (a Sinclair Oil Corporation subsidiary) and Cities Service Oil Company.

Hungary Takes Step Toward Oil Industry Nationalization

Hungarian production in April was 355,600 barrels. A report from Budapest states that the Hungarian Supreme Economic Council has decided on a plan for the "rationalization" of production by the Hungarian-American Oil Company, (M.A.O.R.T.). Under this plan the company will produce 3,780,000 barrels of crude yearly, and the council will insist on a reduction of prices. This probably is a first step toward nationalization of the oil industry in Hungary.

World Oil Writer Makes Third Tour of South American Fields

In keeping with WORLD OIL's policy of maintaining direct contact with foreign as well as domestic operations, George O. Ives, foreign editor, was to arrive in Trinidad August 31 for the first stop in his third visit to producing localities of South American countries.

George O. Ives

During the next three months his survey will lead him to most of the principal oil operations of Brazil, Argentina, Bolivia, Peru, Ecuador, Colombia and Venezuela.

In 1945, and again in 1946 Ives traveled approximately 9000 miles in visiting practically all of the active oil areas of the countries covered, to write first-hand reports on the actual conditions faced by the operators, and the economic significance of the industry in South America.

Austrians Not Receiving Oil Allocations, Council Told

Attention of the Allied Council for Austria has been called to the great discrepancy between the allocation of oil supplies promised the Austrian economy and those actually delivered by the Russians. The oil resources of Austria are within the Russian zone of occupation and consequently are under the control of the Soviets, who have not made precise reports on the disposal of the oil products not allocated to the Austrians. It was pointed out by members of the Council that while the exact productive capacity of the fields is not known, allocations have steadily decreased throughout the year until less than 200,000 barrels were received in July. Even so there has been reported a discrepancy in actual deliveries. Of more than 45,000 barrels allocated to Western Austria for July, only slightly more than 1000 barrels had been delivered during the first half of the month.

Russians Building Gas Line To Link Fields in South

Construction has begun in the Andizjan district of the Soviet Republic of Uzbekistan of a gas pipe line to link the Palvantasj fields with the town of Leninsk. The Republic of Uzbekistan is in the extreme south of Russia, between Lake Aral and India.

Recording a distinct improvement in industrial production as a whole, the report of the Soviet State Planning Commission for the second quarter of 1947 states that the output of crude was 18 percent higher, and gas 23 percent higher than in the same period last year. The quarterly oil production plan was fulfilled to the extent of 107 percent in the western and southern distrcits, and of 102 percent in the eastern districts of the Union.

The world's largest gas liquefaction plant is to be built south of Moscow by Dresser Industries of Cleveland, Ohio. This plant will cost $6 million and is planned to liquefy 4 million cubic feet of gas daily from the recently completed Saratov-Moscow pipe line. Additional drilling is scheduled for the Saratov field.

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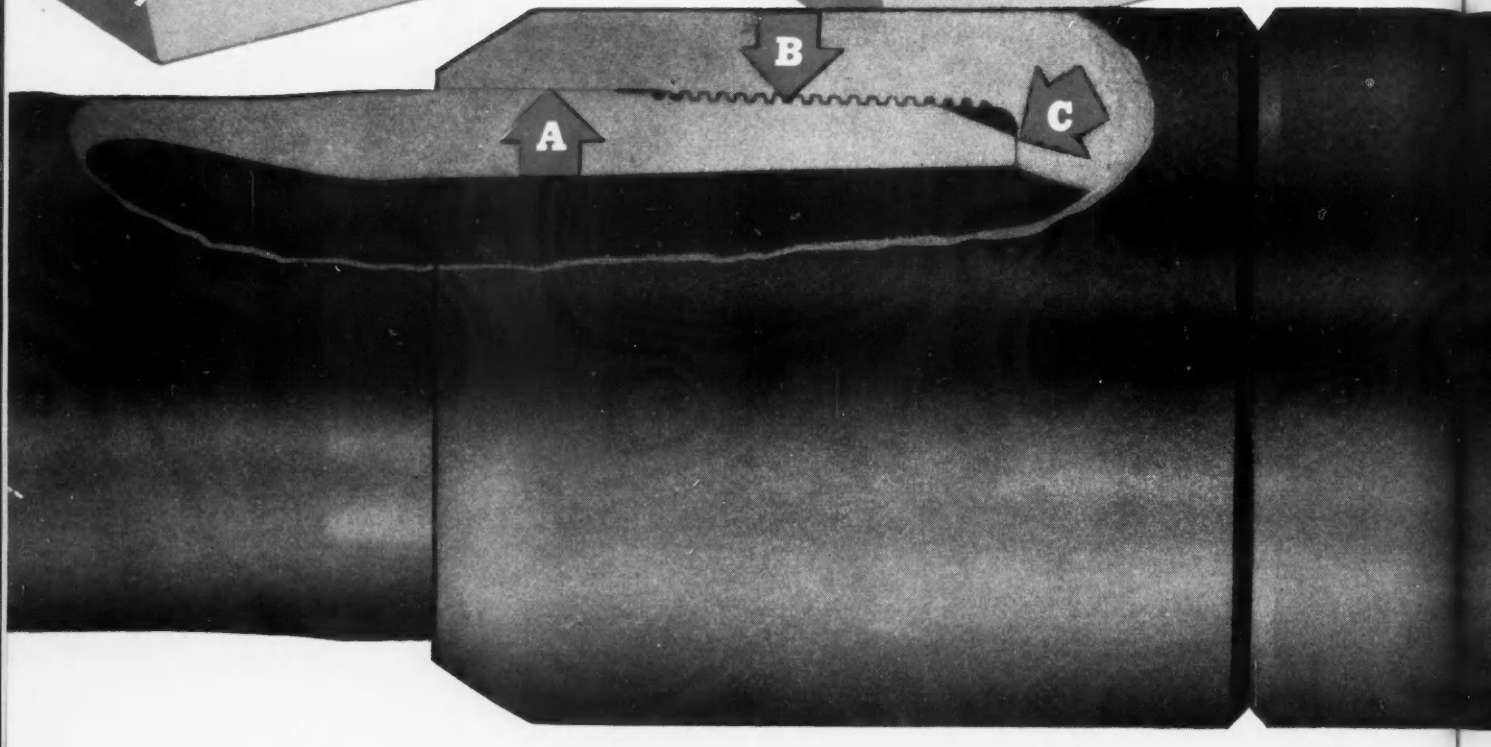

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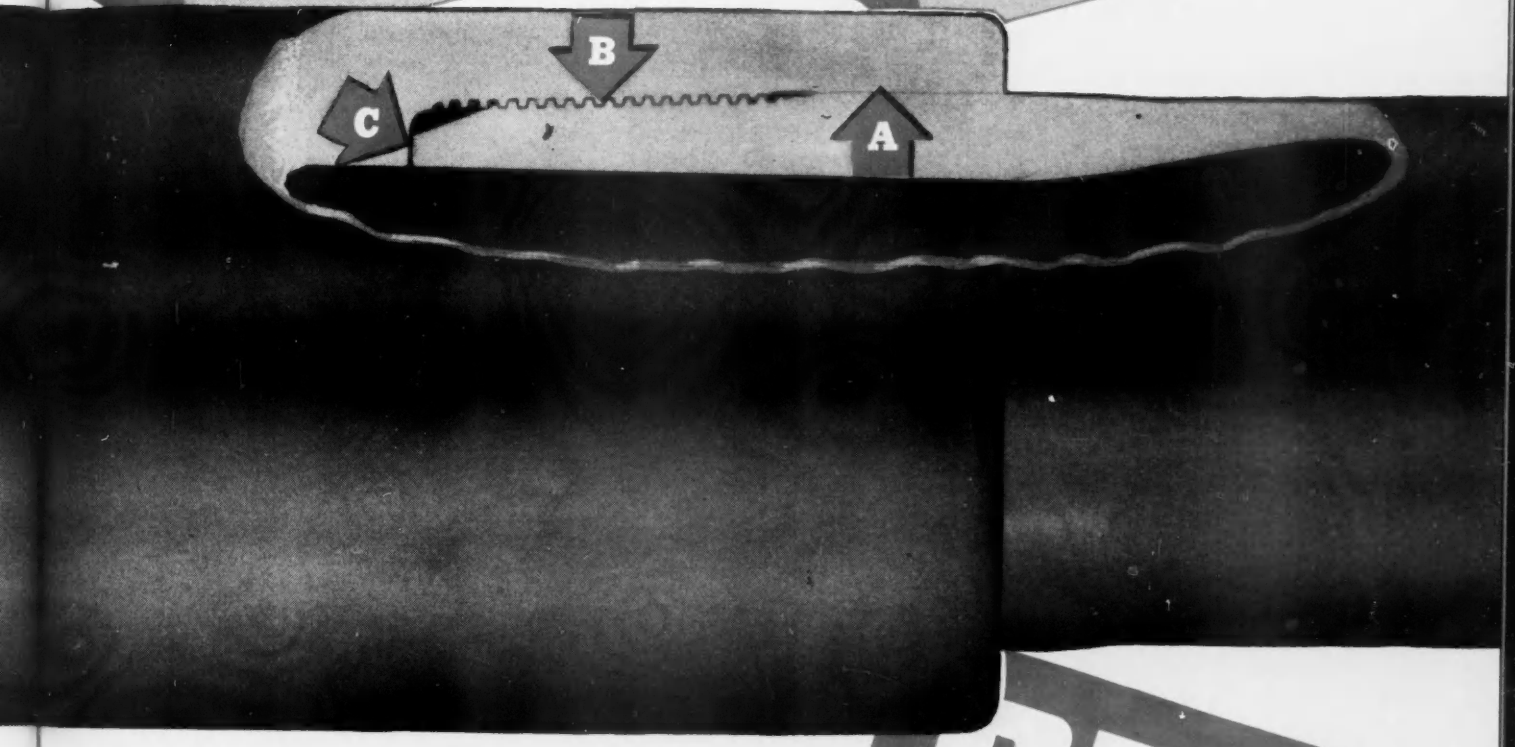

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New Rules Further Restrict Drilling of Private Contracting Firms in Mexico

Highly restrictive regulations have just been revealed under which private contracting firms may drill for oil in Mexico. Under Mexico's fundamental law no foreign interests are permitted drilling rights, even "mixed companies" being banned. But five stipulations set forth by Petroleos Maxicanos, Mexico's state petroleum monopoly, are of such nature that in the opinion of many industry observers they could virtually stalemate contract drilling by even wholly Mexican firms.

The five conditions which Pemex has declared are prerequisite to drilling contracts are as follows:

"1. Drilling will be carried out in the zones and places expressly determined by Petroleos Mexicanos.

"2. The transportation of the drilling equipment, as well as the building of roads and utilization of means of transport for the transportation of the said equipment, will be for the account of the driller.

"3. Should the well be a producer, Petroleos Mexicanos will pay the expenses incurred by the contractor, by means of 35 percent of the applicable production, but only until there has been liquidated the stated expenses account, and may agree that for the same period of time the contractor may acquire from Petroleos Mexicanos 15 percent of the production accruing to this Institution, at prevailing market prices after deducting the import taxes in the country of destination.

"4. If within a zone determined by Petroleos Mexicanos a producing well is obtained, the driller shall have the right to drill further wells within the same zone without the necessity of going to different locations.

"5. If the well should be a dry one, Petroleos Mexicanos obligate themselves to reimburse to the contractor the amount of all expenses incurred, the commission which the contractor may charge on the work performed, as well as the legal interest on the capital which he may have invested in the work performed. Such payments will be made by Petroleos Mexicanos in the form of five and ten-year bonds.

"At present Petroleos Mexicanos can accept applications for the drilling of 25 wells.

Meanwhile, discussions between U. S. oil companies and Mexican government officials have been continuing, and State Department spokesmen have been participating in these negotiations for the possible return of American oil capital to Mexico. Talks have been spurred following Pemex's disclosure of a $340 million oil industry expansion program. Mexico's keen desire for U. S. dollars may induce that nation, some industry officials hope, to soften its oil policy. Indication of this is suggested in the report that Cities Service Oil Company will drill 100 wells in Mexico under conditions not disclosed.

Petroleum production has declined in Mexico by about 75 percent from its peak in 1921, while the country's domestic requirements are increasing.

Poland's Daily Production Rises to 74,190 Barrels

Crude production in Poland during the first half of 1947 was reported at a daily average of 74,190 barrels, or about 10 percent higher than in the similar period last year.

During May, the last period for which complete figures are available, the daily average output was slightly more than 80,250 barrels, plus casinghead gasoline amounting to 6200 barrels and slightly more than 272 million cubic feet of gas. Refinery activity resulted in manufacture of 90,188 barrels of finished products. Incompelte figures for June showed crude production of 81,965 barrels, the highest postwar month, and natural gasoline production totaled 309 million cubic feet.

During May, in addition to domestic supply, Poland imported 270 million cubic feet of natural gas, and 89,969 barrels of fuel and lubricating oils from the Soviet Union. The Soviet zone of Germany sent 34,927 barrels of synthetic gasoline. Other imports included 30,206 barrels of fuel and lubricating oil and 29,557 barrels of crude from Hungary as well as an additional 749 barrels of lubricating oils from Roumania.

The refinery at Trzebinia has regained installations removed by Germany during the war and should be turning out increased quantities of products soon. A synthetic gasoline plant obtained as war reparations from Germany is being constructed at Oswiecin and is to be in operation by the end of the year.

Alberta-Saskatchewan Output Climbs After Five-Year Drop

Alberta-Saskatchewan oil production is climbing again after a five-year decline, and is expected to continue increasing as a result of rising output from Leduc, Lloydminster and other areas.

The Alberta-Saskatchewan production peak was reached in February, 1942, when the daily average reached 29,770 barrels. In that month, Turner Valley accounted for 29,495 barrels daily, other sources only 275 barrels. Turner Valley yield then commenced a decline, as a result of drilling out of the bulk of proven sites and a slow-down in rate of completions. During 1946, daily average production amounted to 19,932 barrels, with Turner Valley averaging 17,456 barrels daily and other sources 2476 barrels. Production reached its low point in March, 1947, when daily average was only 18,159 barrels (15,643 barrels for Turner Valley, 2516 for other fields).

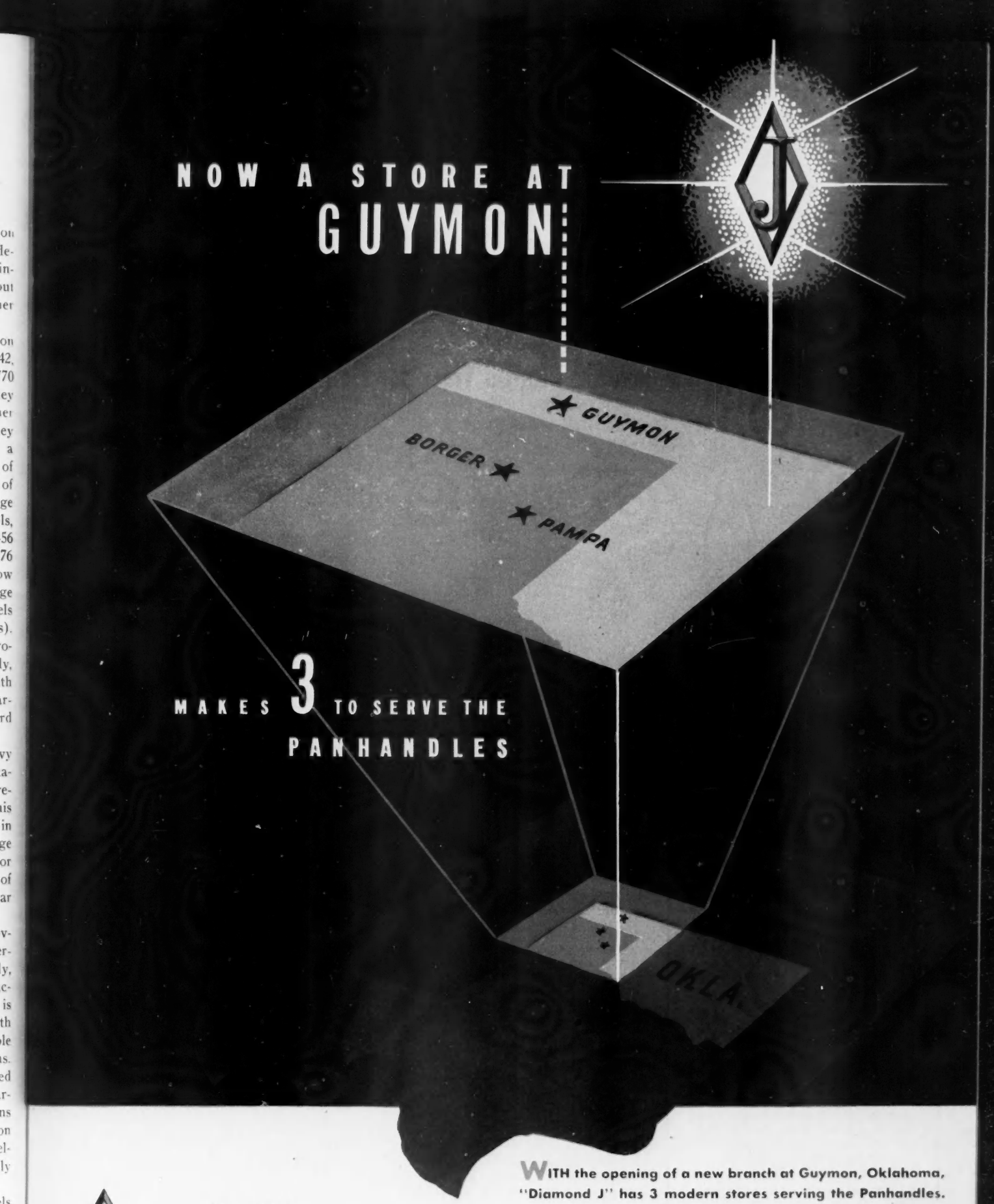
In the succeeding three months, production climbed about 1500 barrels daily, averaging 19,608 barrels in June, with Turner Valley accounting for 14,689 barrels daily and other fields up to a record 4919.

The Lloydminster-Lone Rock 'heavy crude' area, straddling the Alberta-Saskatchewan border, is primarily responsible for the gain. Output from this area climbed to 2355 barrels daily in June, compared with the 1946 average of 584 barrels. (Preliminary data for July show daily average net oil yield of 2534 barrels). Output by the end of year is expected to pass 5000 barrels daily.

Leduc, scene of a 'light crude' discovery in the Devonian last February, averaged 585 barrels daily in June (In July, daily average was 762 barrels). Production of several thousand barrels daily is expected by the end of the year, with accelerated drilling in the considerable area proven up in the past few months.

The Princess area, which averaged 178 barrels daily in 1946, netted 245 barrels daily in June. Several completions since in the South Princess Madison lime pool (23-27 gravity oil) and accelerated drilling are expected to materially boost production by the year's end.

The Taber area averaged 657 barrels daily in June, compared with a 1946 average of 567 barrels. The Conrad field averaged 575 barrels in June, compared with a 1946 average of 583 barrels. Vermilion field gave 418 barrels daily in June, compared with a 1946 average of 504.



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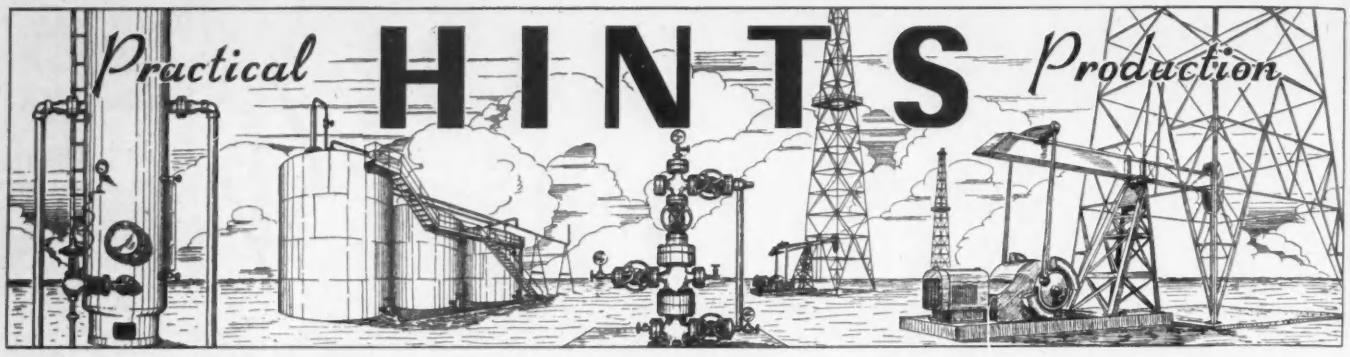

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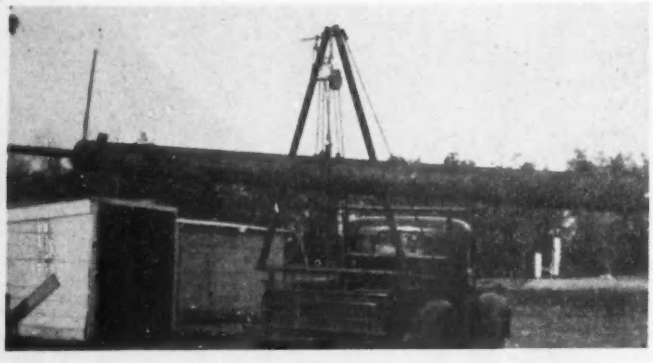
How To—Install Handy Gin Pole on Pick-Up Truck for Heavy Duty Lifting



LIFTING DEVICES

Many occasions arise when heavy equipment must be moved about the lease during the course of normal operations, or when repair work is necessary on oil and gas leases. To hire a large truck for the one moving job involves undue expense, or may cause a long delay in getting a job done. With the increasing scarcity of man power and trucks for hire, such heavy hauling jobs must be handled by fewer men, and mechanical means must be devised in order that such jobs may be done safely and efficiently.

In the installation shown, a removable set of gin poles have been mounted on a half-ton pickup truck equipped with overload springs. The gin poles are made of 2½-inch line pipe, and mounted on a cross piece made of two-inch pipe which has been fitted on upright nipples fastened in the rear frame holes.

The gin poles are suspended by a chain secured by hooks at the base of the headache poles. A "T" shaped pin made of oil chain tong handle holds the poles together at the top of the assembly. Lifting power is furnished by a chain hoist suspended from the gin poles.

A coil line heater weighing 1500 pounds is shown being picked up at the yard for transfer to the lease gathering system. Many items such as Christmas trees, valves, joints of casing, etc., can be picked up and carried, or loaded onto another truck with ease using this method. Many jobs can be performed which would otherwise require a small winch truck or several men.

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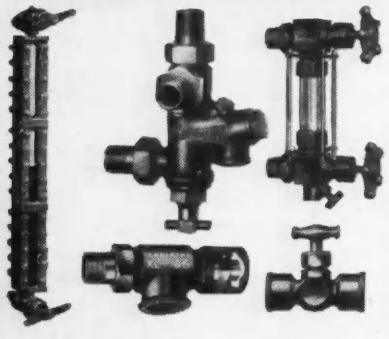

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How To—Attach Ground Lead on Field Arc Welding

WELDING AIDS

One of the common problems of the oilfield welder is the necessity of rigging up ground connections for the arc welding job on which he is working. Usually, a make-shift clamp or weighted steel bar serves to hold the ground connection on while he is welding, but frequently such connections are time-consuming and if the work is moved slightly or shaken, such as on the preliminary assembling of pipe fittings, the ground is broken. An inexpensive, practical means of connecting ground lead to miscellaneous piping, one which is adaptable to medium size line pipe and tubing used in the field, consists of using a worn-out rod holder or "stinger." Connected to the ground lead, the clamp can be used in the manner illustrated, slipping it inside the pipe, with the spring-loaded clamp holding the device inside, or it may be clipped to the pipe edge on larger work.

...becomes a monthly publication

publications, was showing a gain over the previous year, and when the profits of the company were at the most satisfactory point in its history.

The decision was not easy to make, and when we began planning the kind of publication we had long wanted to produce, we found that, again, the road was difficult.

To begin with, it called for more planning than is ordinarily found in a business publication based upon news. It called for more alertness as to the problems of the industry. It called for a willingness to have a staff man spend weeks on just one article which, when completed and published, would occupy only a couple of pages. It called, we have found, for the editorial staff to develop some important changes in its own thinking, and finally it called for a staff of editors several times as large as that of any other monthly oil publication.

Editorial Material Will Be Sectionalized

Our new plans will provide for some features hitherto found only to a limited extent in our publication.

First, there will be a section devoted to an analysis of the news of the preceding month, giving something of its effect on the oil production-pipe line business.

Then there will be a section devoted to highly important special analytical articles on subjects of the liveliest interest to the industry—articles involving, on the whole, a great deal of research. The monthly review, in tabular form, showing new discoveries, deeper sands and extensions, with comments—an exclusive WORLD OIL feature—will be retained. The monthly well completion summary also will be continued. This section alone can be well worth the subscription price—and a lot more.

There will be sections devoted to drilling, production and pipe line practices, embracing staff articles and articles by men within the industry, new ideas and the ever popular "How to Do It Hints." A new type of report on pipe line construction, including plans and progress, will be added as a regular feature.

International Coverage to Be Expanded

The present section which appears once a month on International oil affairs will be expanded, giving the domestic subscriber, as well as the subscriber abroad, a world-wide picture.

The usual departments on new equipment, reports on the personnel of the industry, new faces, promotions, transfers, deaths, will be continued. A book review on petroleum literature will be a monthly feature—and of course, "Squeaks From the Bullwheel." There will be no spot news reporting in WORLD OIL. This applies to field development news as well as national affairs.

Editorial Staff at Work on October Issue

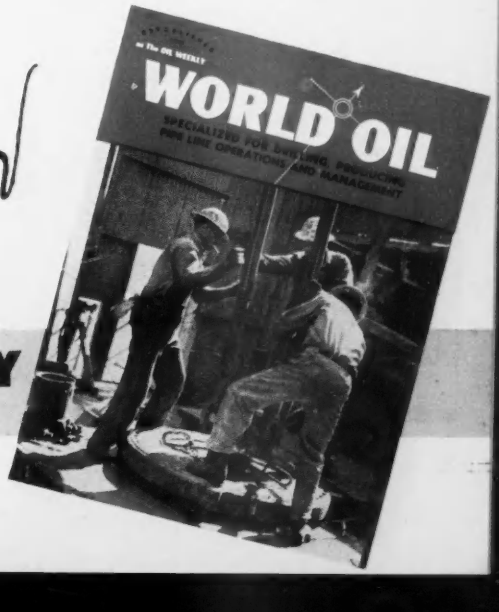
Our staff has had an especially hard burden during the past two months, "getting out" the weekly publication and getting lined up for the monthly. Vacations have been a real treat! And now our editors and staff are settling down to do the job all are enthusiastic to see accomplished. There will be no let-up in their travel. Contact with the industry, at home and abroad, is a *must* under our new plans.

We know you are going to like the new WORLD OIL. Its cover will look just as the weekly WORLD OIL has looked . . . but the publication will be much thicker, more comprehensive, and, we are confident, more interesting and more valuable to you as a subscriber.

Sincerely,

R. L. Dudley

Publisher, WORLD OIL



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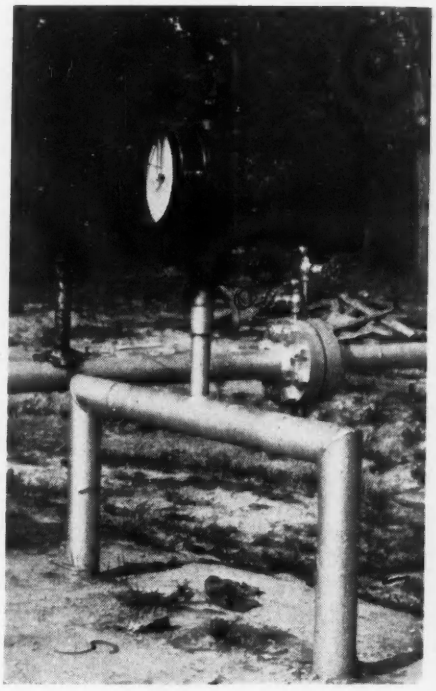
PRODUCTION HINTS

How To—

Eliminate Vibrations in Meter Recorders



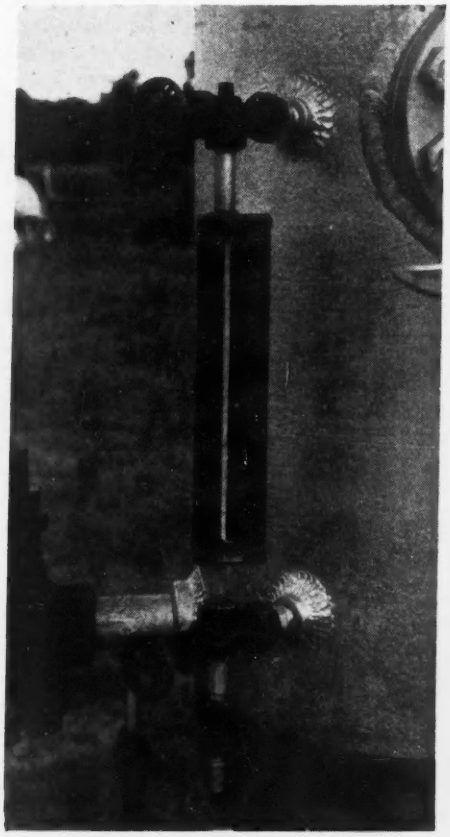
Most operators of condensate wells mount the meter on the flow line at the required distance from the nearest bend in the pipe. This simplifies the setup, but exposes the meter to vibrations if the well flows unevenly. The pound of a kicking well sometimes will throw a meter as much as 20 percent off the correct reading. In many cases, the jarring will shake the ink from the recording pen and only a big blot is seen on the chart.

METER SETTING

A mounting, in the shape of an inverted "U," is set along one side of the run by one operator in the Carthage field. The frame is made of three-inch pipe, and the footings are set in concrete. A two-inch nipple is welded to the center of the cross piece, and the recorder set on this support. The flexible, copper leads from the meter flanges are supported above the meter run on a standard clamped to the pipe, and then across to the meter support.

How To—

Maintain Running Check of Separator Fluid Level



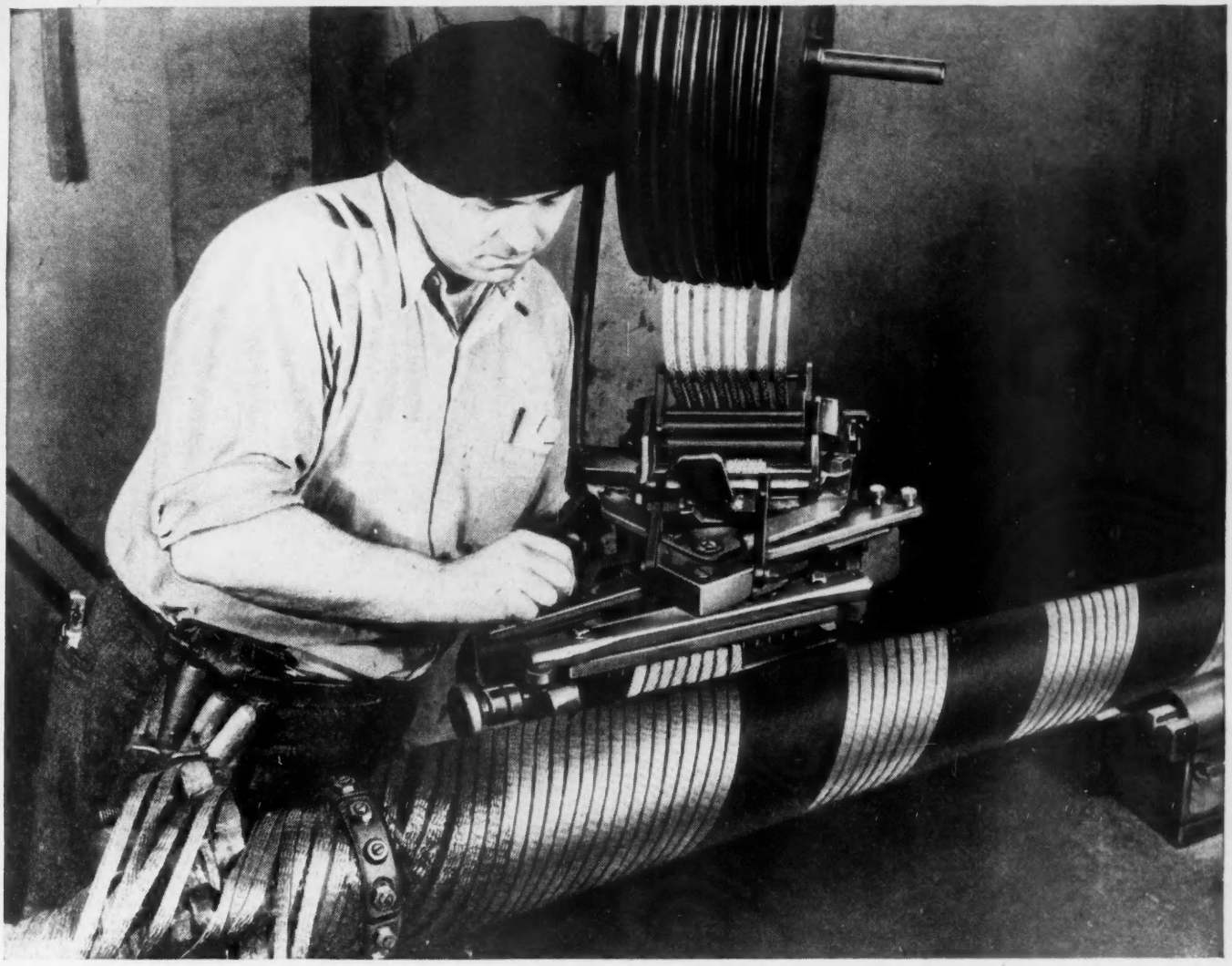
To help him keep track of the liquid level in the separator, the gauger fastened a strip of quarter-inch adhesive tape down one side of the gauge glass. On the white surface of the tape he could make a pencil mark opposite the top of the liquid column. On his next visit another mark could be made, and so on until the fluid needed to be vented.

GAUGING

By checking the levels shown on the tape, the amount of fluid trapped could be secured from the tables. If the tables were missing, the marks would at least show the change in rate of fluid collection.

As soon as one tape was filled with marks it could be stripped off and a new recording surface put in its place. The tape is weatherproof. It will not wash off as chalk or crayon marks do from the gauge castings, and the quarter-inch width of tape may be bought at any drug store.

Although simple and inexpensive, the use of this method has provided the pumper with important information valuable in his work.



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Moreover, when you use Monarch Rotary Drilling Hose with Monarch Rotary Drilling Flexible Discharge Hose (between slush pump and standpipe), you're sure of a trouble-free combination that can withstand abuse of heavy-duty drilling operations.

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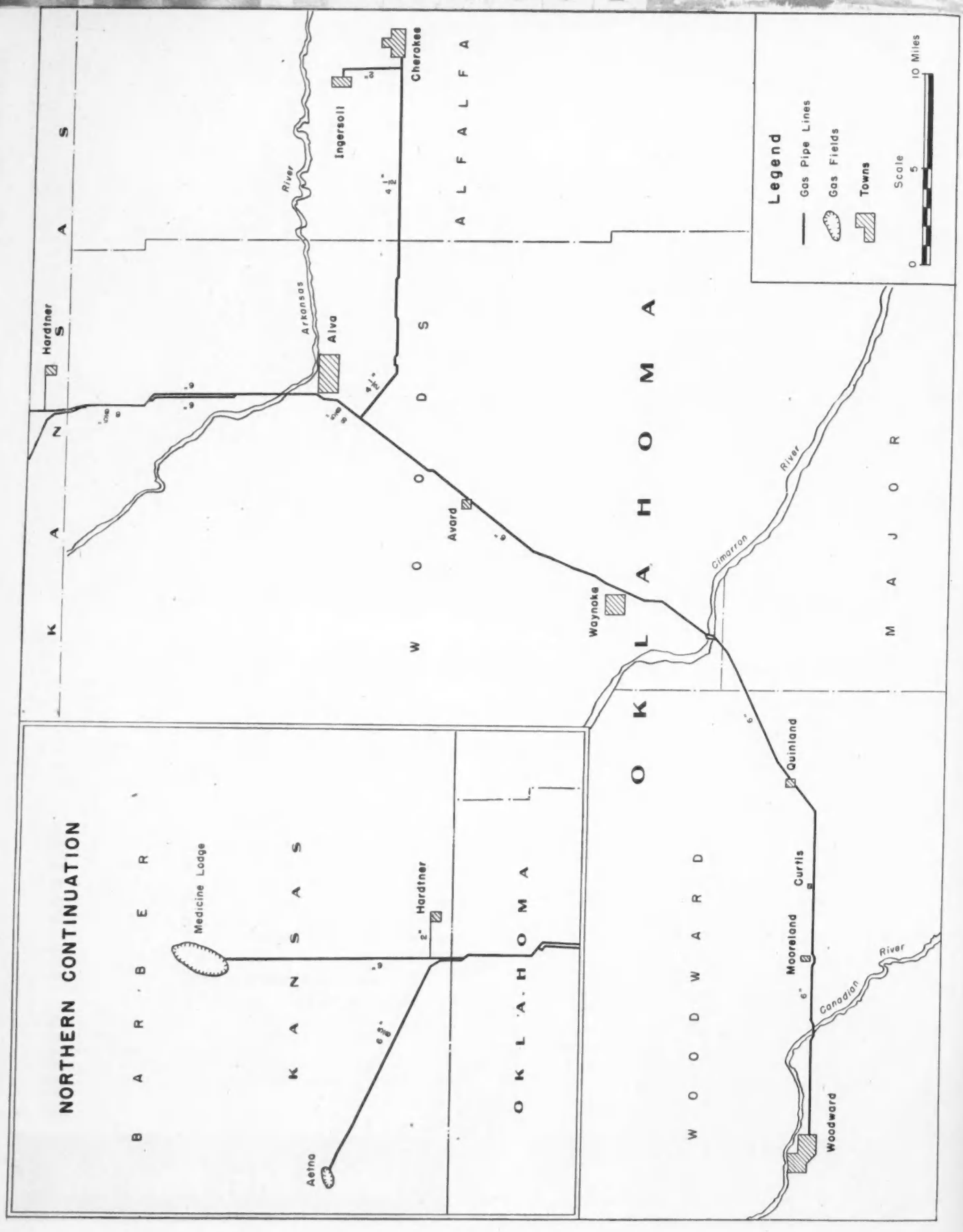

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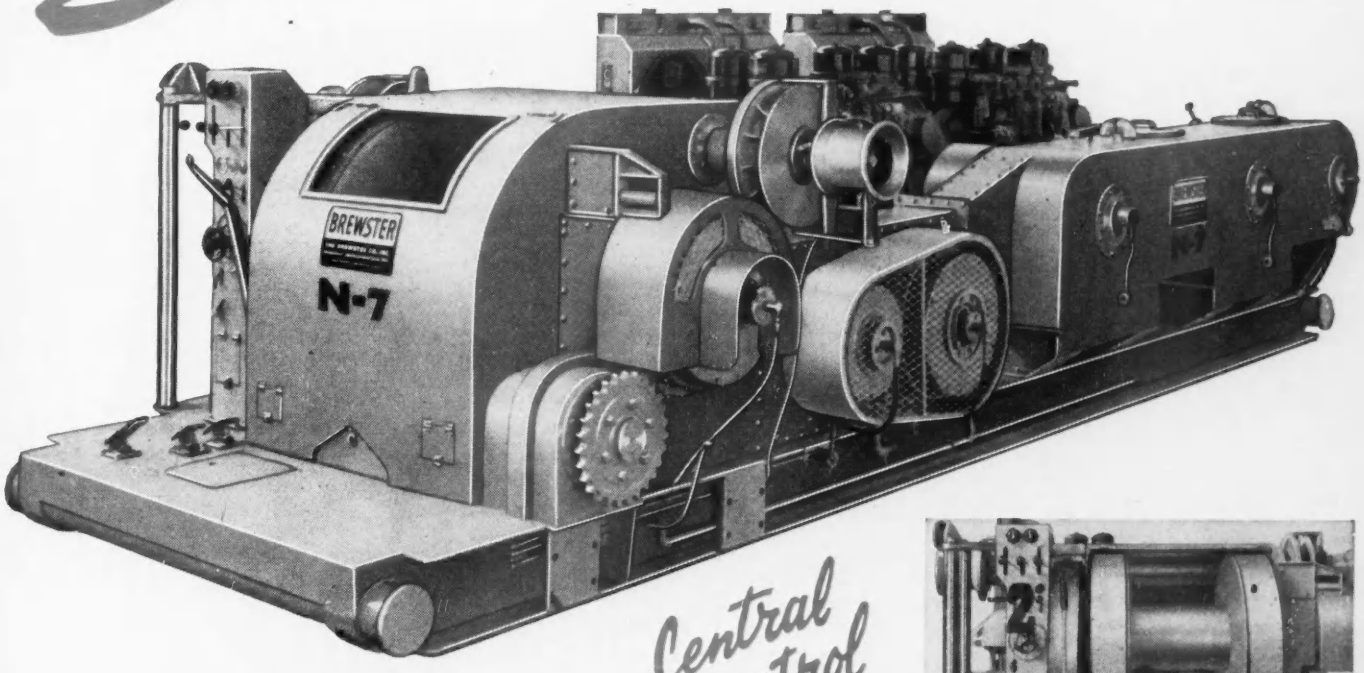

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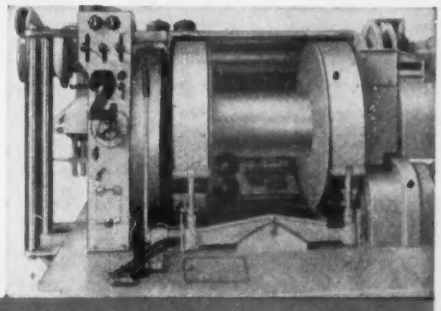
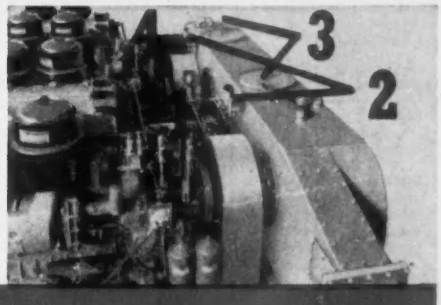


FRONT VIEW Showing (1) quick-action foot throttles, (2) centralized control panel, and with drum guard removed to show (3) air-operated transmission gear shifting mechanism, and (4) brakes and equalizer.

Oilbath Compound



COMPOUND VIEW Showing (1) twin air compressors, insuring immediate air pressure on starting, (2) auxiliary air operated friction clutch controls, (3) compound access doors, and (4) mud pump drive.

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Crude Production and Refinery Runs High, Providing Good Supply of Oils

Both production and processing of crude were continued at near-record levels in the week ended August 23, latest figures of The API showed. Consequently, refinery output of the principal petroleum products was large and fairly well in line with heavy requirements. Stocks of distillate fuel oil were increased, though less than in the previous week. Residual fuel oil stocks were increased more than in the preceding week. Gasoline stocks continued to decrease seasonally and were lighter than a year previously, emphasizing the scarcity of this product in some areas.

U. S. crude production averaged 5,153,000 barrels daily in the week ended August 23, a slight decrease of 6000 barrels from the record rate in the previous week and 317,000 daily or 6.6 percent above the 4,836,000 daily in the week ended August 24 last year.

Crude runs to stills at U. S. refineries averaged 5,217,000 barrels per day in the August 23 week, up 15,000 from the previous week and 264,000 daily or 5.3 percent above the runs of 4,953,000 barrels daily in the comparable week last year. The new rate of refinery runs was, however, considerably short of the record runs of 5,271,000 daily reported in the week ended August 2 of this year.

Production of gasoline, including natural blended at refineries, totaled 16,539,000 barrels in the seven days ended August 23, an increase of 483,000 barrels over the output in the previous week and 1,484,000 barrels or 9.9 percent more than the 15,055,000 barrels produced in the like week last year. Stocks of finished and unfinished gasoline were reduced by 1,068,000 barrels to a total of 83,915,000 barrels in the week of August 23. That amount was 2,124,000 barrels or 2.5 percent less than the 86,039,000 barrels held on the corresponding date last year.

Gas oil and distillate fuel oil production amounted to 5,892,000 barrels in the August 23 week, down 169,000 from the previous week's output but 487,000 barrels or 9.0 percent more than the production in the like week last year. Stocks of distillate were increased 1,433,000 barrels during the week and rose to 53,118,000 barrels. That amount was 888,000 barrels or 1.7 percent more than the 52,230,000 barrels held on the corresponding date a year ago.

Residual fuel oil production of 8,674,000 barrels in the week of August 23 was 157,000 barrels less than that in the previous week but 736,000 barrels or 9.3 percent more than the 7,938,000 barrels produced in the corresponding week last year.

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod.		Runs to Stills		Crude Stocks		Gasoline Stocks		Gasoil and Distillate Stocks		Residual Fuel Oil Stocks	
	Barrels Daily	Week Ended	Barrels Daily	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended
High:												
1942	4,337	2- 7	3,961	1- 3	263,208	3-28	[1]109,281	3-14	47,861	11-14	95,857	1- 8
1945	4,944	7-21	5,140	8-18	227,554	10-13	99,102	3-24	45,341	11-17	56,074	1- 6
1946	4,961	6-15	4,968	12-28	229,430	3- 2	105,223	2-16	[1]67,286	11- 9	61,036	11- 2
1947	[1]5,159	8-16	[1]5,271	8- 2	239,370	5-31	107,576	3-29	58,034	1- 4	54,978	8-23
Lows:												
1945	3,621	10- 6	3,409	10- 6	[2]211,813	8-35	70,791	10-13	26,483	3-17	38,548	5-26
1946	4,403	3- 9	4,498	1-12	218,193	1- 5	85,324	9-28	25,131	3- 9	37,289	4- 6
1947	4,531	4-11	4,667	4-12	220,313	2- 8	83,915	8-23	31,470	4-19	42,668	4-26

TRENDS OF 1946 AND 1947

Trends in Week Ended	Crude Oil			Gasoline		Gasoil and Distillate		Residual Fuel	
	Production Daily	Runs to Stills Daily	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End
1946:									
January 5	4,548	4,651	218,193	14,488	98,494	5,923	35,199	8,867	42,371
January 26	4,626	4,553	220,544	13,622	101,737	5,720	29,498	8,411	39,722
February 23	4,714	4,595	226,699	13,175	104,709	5,728	25,398	7,913	39,290
March 30	4,425	4,684	224,994	13,896	104,715	5,337	28,240	8,738	37,746
April 27	4,672	4,685	224,443	14,228	99,531	5,568	30,466	9,204	39,404
May 25	4,759	4 857	222,214	14,312	95,769	5,463	32,973	8,908	48,368
June 29	4,957	4,854	223,883	14,500	92,333	5,325	37,762	8,828	46,477
July 27	4,926	4,896	223,756	14,535	88,626	5,817	44,316	8,217	49,517
August 31	4,833	4,911	227,132	15,014	87,217	5,630	53,134	8,539	53,173
September 28	4,778	4,829	223,043	14,675	85,324	5,632	59,827	8,172	57,657
October 26	4,730	4,758	221,184	14,863	86,423	5,710	65,499	7,728	60,872
November 30	4,795	4,707	227,693	15,145	88,371	5,258	66,062	7,672	58,647
December 28	4,713	4,968	2.5,995	15,604	93,126	5,931	58,941	8,181	53,427
1947:									
January 4	4,469	4,917	223,291	15,281	94,882	5,957	58,034	8,375	53,285
January 25	4,672	4,820	221,665	14,624	99,801	5,630	50,357	8,224	48,558
February 22	4,786	4,860	224,580	14,668	103,904	5,929	40,739	8,542	44,919
March 29	4,865	4,843	227,529	14,396	107,576	5,969	32,737	8,688	43,364
April 26	4,930	4,725	235,383	14,213	103,860	5,435	32,286	8,186	42,668
May 31	5,024	5,000	239,370	14,709	95,876	5,732	36,032	8,910	45,224
June 28	5,109	5,093	236,221	16,070	91,806	5,006	41,721	8,298	48,490
July 26	5,084	5,162	231,357	16.142	85,812	5,708	47,097	8,738	52,497
August 2	5,098	[1]5,271	231,469	16,517	85,645	6,004	48,574	8,582	53,107
August 9	5,105	5,814	227,779	16,163	84,898	5,932	49,545	8,757	53,531
August 16	[1]5,159	5,202	226,076	16,056	84,983	6,061	51,685	8,831	54,000
August 23, 1947	**5,153**	**5,217**	.....	**16.539**	**83,915**	**5,892**	**53,118**	**8,674**	**54,978**
August 24, 1946	**4,836**	**4,953**	**224,098**	**15,055**	**86,039**	**5,405**	**52,230**	**7,938**	**52,036**
Change:									
In Week	—6	+15	.....	+483	—1,068	—169	+1,433	—157	+978
In Year	+317	+264	.....	+1,484	—2,124	+487	+888	+736	+2,942
In Year	+6.6%	+5.3%	.....	+9.9%	—2.5%	+9.0%	+1.7%	+9.3%	+5.7%

[1] All time peak. [2] Lowest since December, 1921. [3] Stocks, August 10, 1946.

Corning Crude Price Raised 25 Cents in Firm Market

Oil industry markets continue exceptionally tight in virtually all areas, and this condition affects all products and crude oil. Prices remain very firm and in some instances have further increased. As of August 25, there was an increase of 25 cents a barrel for Corning, Ohio, crude in Buckeye lines. Joseph Seep Purchasing Agency of South Penn Oil Company posted a new price of $2.60 per barrel for this crude. This increase was preceded by a 34-cent increase for Corning grade on March 24.

Gasoline remains generally scarce in all districts, with little available in the spot market except at prohibitive prices. Most Mid-Continent refiners are able to supply only their regular customers. Consequently, no substantial volumes are available for taking advantage of the premiums that some prospective buyers are reported to be offering.

The scarcity of all products still persists in the Middle West and Michigan areas, as crude supplies remain inadequate, while refiners find it difficult to supplement their production with purchasers of products from Texas and elsewhere in the Southwest.

In the Appalachian region, also, refiners find it difficult to produce at their plants all the products they could sell, and some are buying from outside sources where possible and reselling. In such cases, there is a tendency of prices to be forced higher, as refiners' quotations on such purchased materials actually represent resale prices.

On the Atlantic Coast there is no particularly acute scarcity of any products, and while prices are firm, they are not being bid upward. In general, suppliers report comfortable inventories of fuel oils and kerosine.

On the Gulf Coast the markets are firm, with the bulk of supplies moving under contracts or through swapping deals, while spot cargo sales are rare.

• Oklahoma

Deep Rock Opens Important Pool in Pottawatomie County

Deep Rock opens important new pool in Pottawatomie County; Shallow oil sands at West Edmond due for new play; Okfuskee County pool has new producing horizon.

Pottawatomie County: For 2 years Oklahoma operators have been punching holes in Pottawatomie County with only slight oil shows in the Wilcox and Pennsylvanian sands. But the search apparently has been rewarded with the opening of what may prove to be an important Wilcox sand discovery at Deep Rock Oil Corporation's Black 1, SE SE NW 17-10n-2e, north of the Lake Shawnee pool. The well flowed 196 barrels of oil in 4 hours and 23 minutes on initial gauge, with more than 1 million cubic feet of gas. The Wilcox sand was topped at 6013 feet and drilled and cored to 6026 feet. Oil tests 37.2 gravity. Location is on an old surface structure checked by seismograph about a year ago.

West Edmond: Although there are only 37 wells in the West Edmond pool producing from the shallower Bartlesville and Cleveland (Pennsylvanian) sands, plans for unitized operation of the Hunton limestone zone may lead to a fairly intensive drilling program aimed at developing production from the higher zones on the structure. Shallower horizons have indicated commercial production throughout the pool but these were passed up with a view of waiting until abandonment of the Hunton zone, then to plug back and perforate in the old holes. It is estimated the depletion stage will not be reached for about 20 years so that shallower wells may be drilled on a new spacing pattern.

Okfuskee County: J. D. Hancock et al's Woodward 1, SE SE SE 13-12n-9e, apparently has proved new oil production in the Gilcrease sand in the old North Okemah pool. Drilled to the dry Cromwell sand at 3220-59 feet, total depth, with casing set on top of the sand, operator plugged back and perforated in the Gilcrease at 3074-90 feet, then shot with 30 quarts of nitro, after which the well flowed 110 barrels of oil in 24 hours. The discovery is on the south end of the structure on a spread of 200 acres assembled by H. B. Davidson of Oklahoma City.

Caddo County: Amerada Petroleum Corporation added another good producer to the Apache pool as Hunter 6, SW NE SE 34-6n-12w, flowed 125 barrels of oil in 24 hours through 5/32-inch choke. Magnolia Petroleum Company et al's Miller 1-A, C NW NE 14-6n-9w, wildcat north of the Cement pool, was drilling below 9512 feet in hard sand and Gulf Oil Corporation's Coleman 3, NE SE SW of 10-5n-9w, in the Cement pool, was drilling below 6705 feet in shale.

Major County: The Superior Oil Company of California, opener of the Ringwood pool in the Anadarko Basin, has assembled a spread in 21n-10w, and was reported preparing to start to test on a well-defined structure. Blackstone and Rowland Drilling Company have started a test offsetting the Ringwood pool discovery well to the north. The Hays 1, SE SE SW 22-22n-10w, will be carried to the Wilcox, although upper Pennsylvanian formations will be carefully tested.

McClain County: Sinclair Prairie Oil Company has another good producer in the East Lindsay pool. Harris 1, CSE SE 36-5n-4w, total depth 10,083 feet, 181 feet in the Simpson formation, on drill-stem test at 9916-10-083 feet with ½-inch bottom and top choke recovered water load in 11 minutes, showed an estimated 3 million cubic feet of gas per day in 14 minutes and oil in 17 minutes. It flowed 1166 barrels of 42-gravity oil in 16 hours. The well is a 1-location northwest extension of the pool.

Noble County: Sinclair Prairie's Bradbury 2, SE NW NW 29-22n-1w, northwest of Perry, flowed 335 barrels of oil in 22 hours through choke after acidizing with 5000 gallons. Total depth is 4736 feet in the Wilcox with casing set at 4736 feet.

Secondary Recovery Session

The 11th annual Secondary Recovery Conference on petroleum will be held October 31-November 1 at The Pennsylvania State College, according to Dr. A. W. Gauger, director of the college's mineral industries experiment station.

West Edmond Hunton Lime Unit Goes Into Effect October 1

The West Edmond Hunton Lime Unit was organized in Oklahoma City to begin unit operation of the field October 1. Sohio Petroleum Company will be unit operator and Harold N. Pardee, formerly with The Texas Company, unit manager.

Earl D. Wallace, vice president in charge of production for Sohio at Cleveland, is chairman of the unit; and Weston T. Payne, vice president of Anderson-Prichard Oil Corporation, Oklahoma City, is vice chairman. No secretary was named.

Chosen on the executive committee were W. H. Atkinson, geologist and operator; W. E. Stagmeier, manager for Fox and Fox interests; T. L. Regan, division superintendent for Stanolind Oil & Gas Company; and C. C. Peppers of Peppers Gasoline Company, all of Oklahoma City; and C. P. Dimit, vice president of Phillips Petroleum Company, Bartlesville, Okla.; Ed Downing, assistant general superintendent of Magnolia Petroleum Company, Dallas; and Wallace and Payne.

Committees to handle departmental work will be named at the next meeting September 12. Sohio is creating a new district at Oklahoma City under Division Superintendent Frank Willibrand.

Wells Completed in the United States in Week Ended August 23, 1947

Data preliminary and subject to revision. Revised and more complete data on all completions and exploration shown in monthly summaries published in last issue of each month.

State or District	FIELD COMPLETIONS: New Wells Oil	Dist.	Gas	*Input	Dry	Total	Old Wells Deepened	EXPLORATORY COMPLETIONS Oil	Dist.	Gas	Dry	Total	ALL COMPLETIONS This Week	Last Week	This Week 1946
Arkansas	6	....	....	...	....	6	....	....	....	....	3	3	9	7	4
California	27	....	1	...	....	28	....	....	....	....	3	3	31	29	31
Colorado	2	....	....	...	....	2	....	....	....	1	....	1	3	2	6
Florida	....	....	....	...	....	....	....	....	....	....	1	1	1	....	1
Illinois	25	....	....	...	17	42	....	1	....	....	10	11	53	8	45
Indiana	5	....	....	...	6	11	....	....	....	....	4	4	15	4	11
Kansas	25	....	5	...	9	39	4	1	....	....	6	7	50	55	41
Kentucky	10	....	....	...	7	17	....	....	....	....	1	1	18	8	13
Louisiana	16	3	2	1	3	25	....	1	....	....	7	8	33	50	31
N. Louisiana	8	2	2	...	....	12	....	....	....	....	6	6	18	27	15
S. Louisiana	8	1	....	1	3	13	....	1	....	....	1	2	15	23	16
Michigan	8	....	....	...	3	11	....	1	....	....	7	8	19	24	21
Mississippi	7	....	2	...	1	10	....	....	....	....	....	....	10	9	4
Montana	5	....	....	...	1	6	....	1	....	....	....	1	7	7	6
New Mexico	5	....	1	...	....	6	1	....	....	....	3	3	10	11	9
New York	14	....	....	16	....	30	....	....	....	....	....	....	30	27	26
Ohio	5	....	12	...	6	23	2	....	....	....	2	2	27	27	25
Oklahoma	53	....	2	2	24	81	4	1	....	....	9	10	95	72	66
Pennsylvania	20	....	16	22	8	66	1	....	....	....	....	....	67	58	49
Texas	117	....	4	...	25	146	3	7	6	2	26	41	190	213	166
DISTRICTS:															
1—S. Central	3	....	....	...	5	8	....	....	....	....	2	2	10	7	6
2—Middle Gulf	5	....	1	...	1	7	....	....	4	....	5	9	16	20	[1]
3—Upper Gulf	5	....	1	...	2	8	....	2	2	1	1	6	14	25	11
4—L. Gulf-S.W.	9	....	....	...	1	10	....	1	....	....	5	6	16	19	29
5—E. Central	1	....	1	...	....	2	....	....	....	....	2	2	4	5	[2]
6—Northeast	7	....	....	...	3	10	....	....	....	1	2	3	13	14	20
7-B—N. Central	4	....	....	...	2	6	....	1	....	....	3	4	11	18	[3]
7-C—W. Central	6	....	....	...	....	6	....	2	....	....	1	3	9	5	[4]
8—West	45	....	....	...	2	47	....	1	....	....	2	3	50	39	42
9—North	24	....	1	...	9	34	1	....	....	....	3	3	38	51	53
10—Panhandle	8	....	....	...	....	8	1	....	....	....	....	....	9	10	5
West Virginia	5	....	16	...	....	21	....	....	....	....	1	1	22	19	13
Wyoming	3	....	....	...	5	8	....	1	....	....	2	3	11	3	2
Total U.S.	358	3	61	41	115	578	15	14	6	3	85	108	701	673	570

* Includes salt water disposal wells. [1] Middle Gulf included with Lower Gulf-S.W. [2] East Central included with Northeast. [3] North Central included with North. [4] West Central included with West.

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Personnel will be taken from the present field forces, if possible.

Peppers' gasoline plant at West Edmond has been sold to Phillips, Sohio and Stanolind, but other unit members may buy an interest at the same price. Continental-Phillips' plant in the old Edmond field will be used in handling gas.

Cities Service Gas Company and Oklahoma Natural Gas Company, the present gas purchasers, are assured uninterrupted delivery during the winter, but contracts provide for a cutoff when gas is needed for repressuring.

The first step will be to shut in high gas-oil ratio wells, of which there are approximately 200, and to get oil from low gas-oil ratio wells. The present allowable of 40,000 barrels daily will be held for a couple of months to study the effect of natural repressuring on the reservoir. Later, the oil allowable will be increased and may reach 50,000 by the end of the year.

Gulf Oil Corporation and The British American Oil Producing Company, only remaining opponents of the plan, have announced they will not appeal the commission order to the Supreme Court. This gives about 92½ percent approval of the program.

• Kansas

Three Oil Pools Are Opened; Ellis County Test Has Show

Three oil pools opened; Continental reports oil show in Ellis County wildcat; new oil area looms southwest of Ray pool; Harbar opens Forest Hill North pool; new pool noted for Rooks County.

Ellis County: On a 30-minute drill-stem test Continental Oil Company's King 1, NE NE SW of 35-12s-20w, recovered 60 feet of oil-cut mud and was testing with prospects good for opening a producing area 3½ miles east of the Ellis pool. With 6-inch pipe set at 3886 feet a drill-stem test was run to 3884-924 feet in Arbuckle lime.

Graham County: About 9 miles southwest of the Ray pool, Bennett & Roberts et al's Rush 1, NE NW NE of 9-6s-22w, is a pool opener after being assigned a potential of 297 barrels of oil daily from the Lansing-Kansas City lime at a plugback depth of 3535 feet.

Russell County: Harbar Drilling Company is opening the Forest Hill North pool at Meier 1, NE NE NE of 20-15s-12w, nearly a mile from Forest Hill production. The wildcat is separated from the Forest Hill pool by dry holes. At last reports the well was pumping about 4 barrels of oil an hour from Arbuckle lime at 3270-83 feet.

Rooks County: Two miles west of the Paradise Creek pool, Phil Polhamus et al have opened production at Baumgarten 1, NE NE NE of 25-9s-19w. Arbuckle lime was topped at 3629-36 feet. following light acid treatment, the well swabbed at the rate of 3 barrels of oil an hour for several hours.

Barton County: Ben F. Brack, Inc., appears to have opened gas production 4 miles northwest of Great Bend at Essmiller 1, NE NE NW 22-19s-14w. Arbuckle was topped at 3498 feet and on test to 3503 feet recovered 120 feet of gas-cut mud in 20 minutes.

Stafford County: Musgrave Petroleum Company et al's Lanterman 1, wildcat in NW NW NW 23-22s-12w, a mile west of the Heyen pool, is being closely watched as operators test an oil show in the Arbuckle topped at 3672 feet.

General Session Highlights Of AGA Program Announced

Eyes of the gas industry will be focused on Cleveland next month when several thousand key members attend the 29th annual convention of the American Gas Association. Meeting at the Cleveland Auditorium, October 6-8, these delegates will hear at first hand speakers from within and outside the industry who will review latest developments and set the course for the next year.

Theme of the convention will be "Gas Has Got It," tying in with the greatest national coordinated promotional program in the industry's history.

Within the framework of three morning general sessions, a home service breakfast, and afternoon meetings of the departments and sections, there will be many attractions. Problems of broad managerial interest will be covered at the general sessions while detailed operating problems will be handled at the sectional meetings.

The convention arrangements committee, under the leadership of J. French Robinson, president. The East Ohio Gas Company, and a past president of the association, has announced some of the highlights of the general sessions program.

R. H. Hargrove, president of the American Gas Association, and recently elected president of the Texas Eastern Transmission Company, will preside and deliver the presidential address at the opening session.

Following an official welcome to Cleveland by Mayor Thomas A. Burke, the convention will get down to business. C. M. White, president, Republic Steel Corporation, Cleveland, will discuss the crux of one of the nation's foremost production problems, the supply of steel and its allocation.

This initial session also will include a report of A. G. A. Managing Director H. Carl Wolf; an accounting of the association's financial position by Treasurer Edward F. Barrett, president, Long Island Lighting Company; and the election of officers for the next year.

Tuesday has been set aside as R. W. Gallagher Day, in honor of the past chairman of the board of Standard Oil Company of New Jersey, who has played a prominent part in the gas industry's progress over a period of years.

Nelson E. Smith, FPC chairman, will talk on natural gas industry regulation.

Another government representative, Max W. Ball, director, Oil and Gas Division, Department of the Interior, Washington, is to address the Natural Gas department.

As spokesman for the manufacturing industry, D. P. O'Keefe, president, Gas Appliance Manufacturers' Association, will speak on the trends and prospects in gas appliance developments.

The presentation of awards for outstanding individual achievements will round out this second session.

The final general session will be opened with the keynote speech, "Gas Has Got It," by J. J. Quinn, vice president, Boston Consolidated Gas Company.

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• West Texas

Sterling County's Producer Makes Flow from Ellenburger

Sterling County's first commercial producer makes natural flow from Ellenburger; Crocket County wildcat encounters additional oil pay; Dollar Hide field has prolific Ellenburger-pay strike; Hockley County has major extensions; Ellenburger discovery in Ector County given 2 offsets.

Sterling County: Plymouth Oil Company's Frost 1, C NE SW H&TC 39, Block 2, discovery on a 13,706-acre lease block, flowed an average of 8 barrels of 49.5-gravity oil with negligible gas volume hourly on preliminary test through drill pipe, and has set tubing to acidize. This production is from perforations at 8356-76 feet in Ellenburger, topped at 8354 feet, and drilled to 8379 feet. No water was reported in drilling 25 feet of the dolomite pay. Five previous Ellenburger tests in the county were failures.

Crockett County: Byrd & Frost, Inc., and Gulf Oil Corporation's Mayberry 1, NEc H&TC Ry. 39, Block 31, wildcat that confirmed flowing production from higher levels, flowed 89.7 barrels of 39.8-gravity oil, with gas-oil ratio 1602/1, during a 4-hour drill-stem test of unidentified lime at 6309-99 feet. Drilling was resumed to fulfill Ellenburger penetration contract after a drill-stem test at 6438-85 feet proved dry. This wildcat flowed at the rate of 25 barrels of oil hourly through drill-pipe at 6293-376 feet, then tested gas and distillate at 6276-389 feet. The producing horizon was originally identified as Devonian, and tentatively changed to Wolfcamp, which is somewhat erratic in performance and subnormal in crude yield per acre.

Ector County: Humble Oil & Refining Company's Yarbrough & Allen 1, pending Ellenburger prolific discovery, will complete from open hole, with 5½-inch pipe at 10,596 feet, after logging effective dolomite-pay at 10,515-600 feet in Ellenburger, topped at 10,495 feet. This wildcat flowed 110 barrels of 41-gravity oil, with gas-oil ratio 871/1, during the last hour of a drill-stem test at 10,568 feet. No test was made of the lower section. Humble was starting a southwest offset, while Magnolia Petroleum Company was starting a north offset. The outlook is favorable for this Ellenburger strike to embrace a large area, with Devonian production available near the apex.

Gulf's Goldsmith 430-E, Ellenburger discovery for the Goldsmith field, flowed 301 barrels of 46.8-gravity oil, with gas-oil ratio 593/1, on natural test through 1/16-inch choke, carrying 970 pounds back-pressure on tubing. Production is from perforations at 9495-9535 feet in Ellenburger, topped at 9495 feet, with water in bottom at 9645 feet.

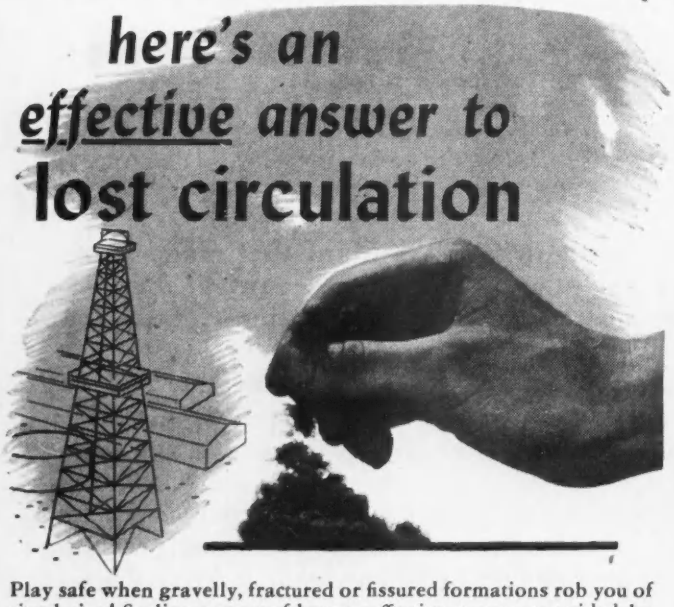
Phillips Petroleum Company and The Texas Company's Cowden-McEntire 1, wildcat between the Andector and Goldsmith-Clear Fork fields, with an unusually thick section of Clear Fork pay that yielded flush production, was drilling dolomite at 7760 feet. Basal Wichita-Albany lime registered possible production as a drill-stem test of this zone at 7360-544 feet yielded gas to the surface within 47 minutes, and the recovery consisted of 1890 feet of heavily oil- and gas-cut mud and 900 feet of muddy salt water.

Andrews County: The Pure Oil Company and Humble's Cowden 1, north outpost for the Dollar Hide field, will deepen to establish the pay-thickness of the Ellenburger, which registered a flow of 50 barrels of 43-gravity oil per hour rate and daily flow of 3 million cubic feet of gas when tester was used at 10,033 feet. Pipe was cemented at 9975 feet, using radioactivity material with cement to test effectiveness of its protection of upper pays. Cowden 1 confirmed probable oil production in the Wichita-Albany, new pay for the field, Devonian and Silurian as well as providing the initial Ellenburger producer. The owners have a solid lease of 2530 acres.

Stanolind Oil & Gas Company's Sims 1, C SE SE PSL 16, Block A-39, north offset to the most westerly Ellenburger producer in the Nelson 3-well field, encountered barren Ellenburger at 10,760 feet, or 351 feet low, and logged granite at 10,871-902 feet. Pipe probably will be run for a production test of promising oil show in Basal Clear Fork at 7214-431 feet, as this zone also indicated production in the offset producer.

Plymouth Oil Company's Cowden 1-I, C SW SW T&P 1, Block 45, T-2-N, recent Ellenburger failure on the northeast edge of the Andector field, was reworked for completion as a 7,100,000-foot gasser from San Andres perforations at 4220-50 feet. This is a new zone for the area.

Winkler County: Magnolia Petroleum Company's Wheeler 1, C SE SE PSL



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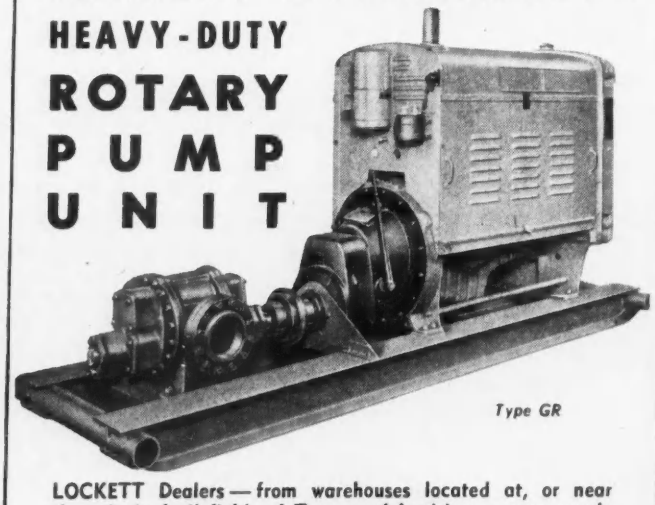

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13, Block 40, wildcat that tested a show of gas in Devonian, topped at 9340 feet, or 339 feet high to nearest failure, was drilling at 9575 feet in Silurian, entered at 9540 feet. The latter marker correlates 324 feet high, thus maintaining the structural relief that makes this a good Ellenburger prospect. The Fusselman, or producing zone of the Silurian is due near the 9710-foot level.

Magnolia's Walton-State 1, deepened shallow producer on the west edge of the Keystone field and ⅞ mile southeast of the Kermit-Ellenburger 2-well area, failed to indicate commercial production in the Devonian, topped at 8210 feet, with elevation of 2921 feet, and was drilling at 8390 feet.

Hockley County: Jas. Fitz-Gerald, Jr., et al's Coble 1, NEc W½ Labor 46, League 69, Hardeman County School Lands, 1¾ miles southeast of the discovery well of the Levelland field and nearest production, flowed 21 barrels of oil per hour through 1-inch choke on preliminary test after acidizing San Andres open hole at 4766-4830 feet.

Geo. P. Livermore, Inc.'s DeLoache-Texaco 1, SWc Labor 24, League 78, Reeves County School Lands, and 1⅞ miles northwest of production in the Slaughter field's northwest extension sector and 1⅝ miles west by south of production in the west extension of the Levelland field, was showing for a commercial pumper. The well averaged 3 barrels of oil and acid residue per hour on swabbing test after using 13,000 gallons of acid in open hole at 4765-83 feet. The San Andres was topped at 3820 feet, with elevation 3629 feet.

Eugene Constantin et al's Coble 1-A, Labor 50, League 69, Hardeman County School Lands, southwest extension for the Levelland field, was showing for a flowing producer, topped at 3860 feet, and drilled to 4855 feet.

EXCLUSIVE MID-CONTINENT REPRESENTATIVES: Hunt Tool Company, P. O. Box 1436, Houston, Texas
EXCLUSIVE EXPORT REPRESENTATIVES: Hunt Export Company, 19 Rector Street, New York City, N. Y. • Avda Pte. R. Saenz, Pena 832, Buenos Aires, Argentina

Bids On U. S. Royalty Oil in New Mexico Are Invited

An invitation to bid on the sale of government royalty oil in New Mexico was extended last week to the oil industry by Secretary of the Interior J. A. Krug. Bids, in duplicate, will be received in the office of the director of the Geological Survey, Department of the Interior, Washington 25, D. C., on or before noon (D.S.T.), September 16 and will be opened at 2 p.m. on that day.

The procedure for the sale, in accordance with the provisions of the Mineral Leasing Amendment Act of 1946, will give the owners of small refineries with insufficient supplies a preference to buy such oil to maintain operations of their refineries. The sale will cover royalty oil under seven items in monthly volumes of about 1400 barrels from the Brunson pool, 2160 barrels from the Eaves pool, 14,900 barrels from the Eunice-Monument pool, 970 barrels of unitized and 9100 barrels of non-unitized oil from the Grayburg-Jackson pool, 14,600 barrels from the Maljamar pool, and 3000 barrels from the Rhodes pool.

Standard Officials Meet

Officials of Standard Oil Company (N. J.) and subsidiaries met in Denver for a general conference concerning Rocky Mountain activities of the company. Among the visitors were Eugene Holman, president; J. E. Cranex, director; and L. F. McCollum, vice president for production, all with Standard of New Jersey; and O. C. Schorp, president; J. R. McWilliams, vice president for production; H. F. Miller, vice president for crude purchasing; F. W. Butler, vice president for marketing; R. B. Curran, vice president for the Northwestern division; and D. G. Levick, division sales manager, all with The Carter Oil Company; and Henry C. Weiss, president; and Hines H. Baker, executive vice president, with Humble Oil & Refining Company; and H. H. Hewetson, president; and O. B. Hopkins and J. R. White, vice presidents, with Imperial Oil of Canada.

• North Texas

Discovery in Grayson County Makes Natural Strawn Flow

Grayson County discovery makes natural flow from Strawn; Ellenburger-pay sector of Fargo field defined to north; Childress County wildcat is failure in Ellenburger.

Grayson County: Standard Oil Company of Texas' Covey-Bates Unit 1, J. B. McAnair Survey and 2 miles north of Sherman, opened a new Strawn sand field in flowing 141 barrels of high-gravity oil by heads on natural test through ½-inch choke. Production is from open hole at 3782-89 feet, and is 1¼ miles east by north of the company's 11,541-foot Ellenburger failure that passed up several prospective oil zones in the Strawn series. Standard assembled a block of about 20,000 acres, carrying 10-year leases, after extensive geophysical surveys of the area, and paid a maximum of $100 per acre for small tracts within its block.

The Texas Company's Handy 6, Sam Stewart Survey and offsetting production in the Handy multi-pay field, failed to indicate commercial production in

the Upper Strawn zones, and developed 180 feet of oil and 90 feet of oil-cut mud and a new sand at 2369-94 feet. It was drilling sandy-shale at 2420 feet.

Wilbarger County: Vickers Petroleum Company's Irons 1, southwest corner of P. Martinez Survey and 3000 feet north of Ellenburger production in the Farbo field, was abandoned short of its Ellenburger objective and at 5820 feet due to low structural position. The Canyon was entered at 3600 feet.

Jack County: Continental Oil Company's Smith 1, NW NE Sect. 2564, TE&L Company Survey, and 2⅜ miles southwest of Perrin, was running pipe to try for completion in the Bend after plugging back from water in Ellenburger at 5494-609 feet. The Bend was entered at 4819 feet, and showed probable oil and gas production to 4875 feet.

Childress County: Amerada Petroleum Corporation's Middleton 1, C SE NW W&NW Ry. 388, Block H, wildcat, entered Ellenburger at 8340 feet, with elevation 1669 feet, and was abandoned after testing water at 8497 feet.

Archer County: Southern Petroleum Exploration Company, Inc., and Chas. E. Morrison's L. F. Wilson 1, Lot 1, Sect. 71, ATNCL, a mile north of the original Canyon producing area for the county, logged nominal oil shows in 2 Canyon zones, and a drill-stem test of the first sand in the Strawn sand at 3657-60 feet yielded 30 feet of oil-cut mud. Minor oil shows were logged at 3861-76 and 3886-903 feet.

• East Texas

Blackfoot Structure Wildcat Develops Oil Flow from Pettit

Anderson County wildcat on Blackfoot structure develops natural oil flow from Pettit; Smackover producing area in Bowie County lists failure; Red River County prospect tests water in Travis Peak.

Anderson County: Sanders and Murchison's Broadway 1, I. P. Reinhardt Survey, proved the Blackfoot structure for oil production in flowing 9 barrels of 44.6-gravity green oil hourly while cleaning itself through 3/16-inch choke from 2 zones of perforations at 9736½-40½ and 9750½-58½ feet in Pettit, topped at 9644 feet. Electrical log placed Pettit porous zone at 9732-60 feet. This wildcat was plugged back from barren Travis Peak at 9876-10,187 feet. A promising oil and gas show passed up in the Upper Rodessa at 8956-71 feet has not been tested other than a drill-stem test while drilling. Phillips Petroleum Company and The Texas Company are among the largest owners of nearby leases.

Bowie County: Barnsdall Oil Company et al's Pickering 1, George Morris Survey A-372, and southwest offset to their Smackover oil discovery for the Eylau pool, entered barren Smackover at 7771 feet, correlating 121 feet low, and was abandoned at 7835 feet.

Red River County: N. S. Slagle et al's Southern Pine Lumber Company 1, D. D. Bruton Survey and 12 miles north by east of Clarksville, was awaiting orders after testing water from open hole at 2120-30 feet in Travis Peak, topped at

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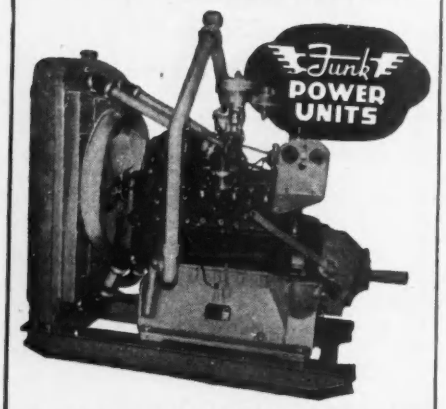

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2110 feet. Pipe was set for production test on strength of nominal oil show in bottom 7 feet.

Van Zandt County: B. G. Byars et al's Jones 1, E. C. Bryant Survey, wildcat that is seeking Paluxy production on a southwest trend from the Mount Sylvan field, showed water in the Woodbine, topped at 5000 feet, with elevation of 456 feet, and was drilling at 5760 feet.

Henderson County: Sun Oil Company's Watkins 4, John F. Hathen Survey, deepened Woodbine producer on the north end of the Cayuga field, was drilling at 7620 feet, having entered the massive anhydrite at 7517 feet, with elevation of 343 feet. It is seeking production in the Rodessa, which yields oil from a single well and gas-distillate on the west side of the structure.

Freestone County: Humble Oil & Refining Company's McWatters 1, G. W. Lamb Survey and 1½ miles south of Freestone, entered the Woodbine at 4760 feet, and encountered water in drilling to 4775 feet. This wildcat is scheduled to explore the Cotton Valley, or drill to 12,000 feet.

Harrison County: Stanolind Oil & Gas Company's George Slaughter 1, wildcat in J. E. White Survey, is drilling below 10,160 feet in the Cotton Valley, about 1000 feet above the Smackover goal. Deepening will depend on the hardness of strata still to be penetrated.

Southern Production Company abandoned W. H. Cargill Estate 1, wildcat in P. Dougherty Survey, at 6696 feet. A 1-hour drill-stem test at 6479-557 feet had a steady gas blow but recovered only drilling mud.

Shelby County: Humble Oil & Refining Company's Elzie Fleming et al 1, John Hailey Survey, Huxley field deep test, squeezed perforations at 5300-05 feet and was preparing to resqueeze at 5490-95 feet.

94 Percent of Employes Enroll In Company's Retirement Plan

Approximately 94 percent of all the eligible employes of Standard Oil Company (Indiana) and subsidiaries have enrolled in the companies' new retirement plan, which has been described as the top 10 percent of all retirement plans from the viewpoint of liberality.

One hundred percent of the eligible workers in the crude oil purchasing department, pipe line department, and ten sales fields of Standard of Indiana have enrolled in the amended plan.

Annuities about a third larger than under the previous plan for nearly all present employes when they retire and for the majority of present annuitants are provided in the plan, which became effective July 1 following approval by stockholders and the Bureau of Internal Revenue.

Under the amended play, payments of the parent company and subsidiaries for service after July 1 will average about $1.60 for each dollar paid by employes. In addition, in order to finance the larger annuities for past service provided for in the amended plan, the companies expect to set aside a fund of approximately $28 million, of which $5 million was deposited July 1. This fund is in addition to an annuity liability of approximately $40 million assumed earlier in connection with service prior to January 1, 1939, and now largely "funded."

• South Central Texas

Navarro Sand Production at Charlotte Field Extended

Navarro sand production at Charlotte field extended southwest; Luling field well still testing; Frio County deep test drills below 11,337 feet.

Atascosa County: Kirkwood & Morgan et al's McLean 1 has extended Navarro sand production at Charlotte field 1½ miles southwest. Details of the test have not been released but open hole was tested at 5155-237 feet in the Navarro, topped at 5156 feet, and oil shows were had at 5156-69, 5174-96, 5201-04 and 5219-31 feet. This well is 467 feet from the northeast and northwest lines of J. Poitevent Survey No. 1, A-695.

Caldwell County: Magnolia Petroleum Company's Trammell 20, Luling field, was still testing. On latest gauge the well pumped 20 barrels of oil and 400 barrels of water daily from open hole at 2149-77 feet in the Edwards lime, topped at 2105 feet.

Frio County: Magnolia's McKinley 1, wildcat 6½ miles northeast of Pearsall is drilling below 11,337 feet. Projected total depth is 12,000 feet.

• Southwest Texas—Lower Coast

New Pay Zone Discovery in Bishop Field Is Completed

New pay zone discovery at Bishop field completed; North Magnolia City production extended southeast; Blucher field production extended northeast. outpost at La Reforma tests gas and condensate.

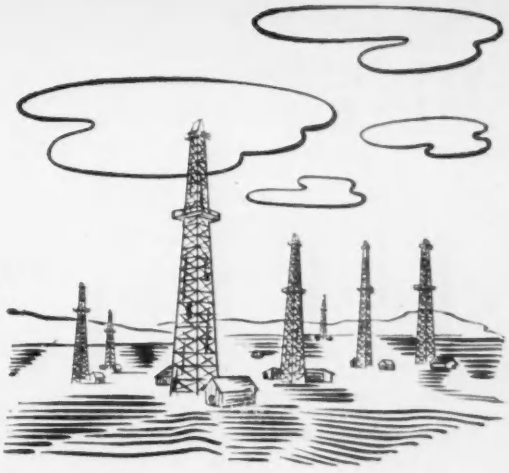
Nueces County: H. R. Smith and W. C. McBride's King Ranch 1 has discovered an oil pay at Bishop field. On potential the well flowed 66 barrels of 41-gravity oil daily on 7/32-inch choke with gas-oil ratio 375/1. Total depth is 8320 feet with 5½-inch casing set to 7899 feet and perforated at 7800-34 feet for completion. This well is 990 feet west of the same operator's Kaiser 1 completed from perforations at 7133-36 feet. The King Ranch 1 tested gas and condensate at 7085-89 feet and salt water at 7109-12 feet and was drilled to the deeper zones.

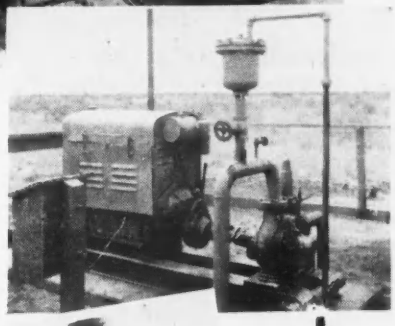
Jim Wells County: Sinclair Prairie Oil Company's W. H. Evetts 1 has extended production southeast at North Magnolia City field. On potential the well flowed 100 barrels of 31.1-gravity oil daily through 5/64-inch choke with tubing pressure 300 pounds and gas-oil ratio 583/1. Total depth is 5818 feet with 5½-inch casing set to 5552 feet and perforated at 5136-42 feet for completion.

Blanco & Buchanan's Blucher et al 1, extension test ¾ mile northeast of Blucher field production, is being completed from perforations at 7442-49 feet with no gauge of production taken.

Hidalgo County: Baldridge & King's Guerra estate 2-B, outpost on the southeast flank of La Reforma field, tested gas and condensate on a drill-stem test. Drill pipe was stuck at 6710 feet after a drill stem test at 6276-85 feet developed 600 pounds working pressure in 10 minutes and recovered 10 feet of condensate-cut mud with bottom-hole pressure 2770 pounds open and 2880 pounds closed.

The Texas Co., uses Model FC Waukesha Engine to drive gathering pump at Paul's Valley, Oklahoma.





Humble Oil Co., in Ec'or Co., Texas, uses Model XAH Waukesha Engine to drive pipe line gathering pump.

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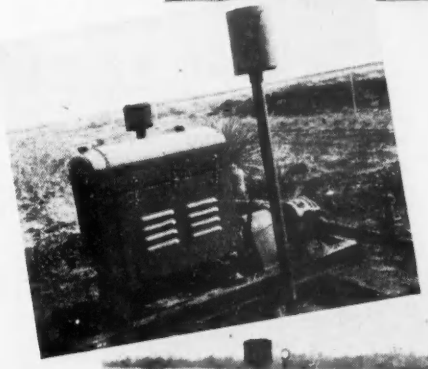
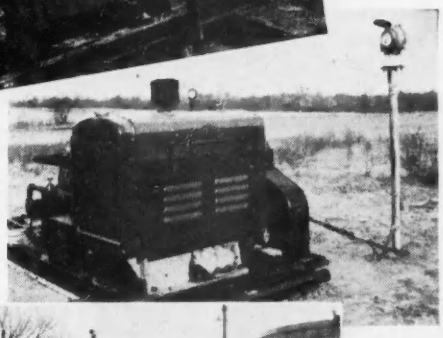


Gulf Pipe Line Co., Eunice, N.M., uses Model FC Waukesha Engine to drive rotary gathering pump.



Mid-Continent Pipe Line Co. uses Model XAH Waukesha Engine to drive pipe line gathering pump at Holdenville, Oklahoma.

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Model GAK Waukesha Engine drives high pressure pipe line pump for Mid-Continent Pipe Line Co. at Moore, Okla.

High pressure pipe line pump driven by Model XAH Waukesha Engine, used by Mid-Continent Pipe Line Co., at Moore, Oklahoma.

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• Middle Texas Coast

Discovery in Slick-Wilcox Field Area Is Completed

Discovery northeast of Slick-Wilcox field completed; Quintana completes discovery in Calhoun County; new pay zone tested at La Gloria.

Goliad County: Dan Auld and J. C. Hawkins' Heinrich 1, discovery 3 miles northeast of the Slick-Wilcox field, has been completed and been given the field name of Heinzeville. On potential the well flowed 3,200,000 cubic feet of gas and 108 barrels of condensate daily through ¼-inch choke with tubing pressure 1490 pounds. Total depth is 7774 feet with 5½-inch casing set to 7770 feet and perforated at 7560-66 feet in the Slick sand (topped at 7556 feet) for completion. This discovery is on a 177-acre tract in Cyrus Connely Survey A-116 and 3 miles northwest of Weesache.

Calhoun County: Another gas-condensate discovery is Quintana Petroleum Corporation et al's L. J. Foerster 1, 2 miles northeast of Sheriff field and 3 miles west of Port Lavaca field. On potential the well flowed 7,910,000 cubic feet of gas daily on open flow with shutin pressure 3015 pounds. On ¼-inch choke the well flowed at the rate of 4,090,000 cubic feet of gas daily with 2835 pounds working pressure. Total depth is 10,064 feet with 5½-inch casing set to 9745 feet and 4-inch liner set to bottom. A new test for the area is the same operator's Foerster 1-A, ½ mile northwest of the No. 1.

Brooks County: At La Gloria field Magnolia Petroleum Company tested gas and condensate from a new pay zone in the Lohmann Heirs 1. From perforations at 8795-828 feet the well flowed an ungauged amount of gas-condensate. Total depth is 9200 feet with 7-inch casing set to 8857 feet. This well is 1 mile southwest of "Church Zone" oil production and 1¼ miles southeast of south flank oil production.

• Upper Texas Coast

Gas-Condensate Production Tapped Southwest of Clodine

Gas-condensate field discovered southwest of Clodine; north edge Sugar Valley well completed; Glendale field well makes new production tests; casing set in northeast extension at Fairbanks.

Fort Bend County: In the Clodine area Jack Frazier and Grubb & Hawkins' J. R. Farmer 1 has discovered a gas and condensate producing field. Drilled to total depth of 7665 feet, 5½-inch casing was set to 7635 feet and perforated at 7559-63 and 7578-82 feet for completion. On initial test the well flowed gas and condensate with no gauge taken. This discovery is on an 80-acre lease in I.&G.N. Survey A-353 and is 1½ miles southwest of the Clodine field.

Matagorda County: Stanolind Oil & Gas Company's Helen Hurlock 3-A, north edge of Sugar Valley field production, has been completed and given potential test. It gauged 114 barrels of 34-gravity oil daily through 7/64-inch choke with tubing pressure 2225 pounds, casing pressure 3100 pounds, and gas-oil ratio 2545/1. Total depth is 9056 feet with 7-inch casing set on bottom and perforated at 8976-84 feet for completion.

Trinity County: Magnolia Petroleum Company's Bolton 3, Glendale field area and 5443 feet northwest of the No. 2 gas and condensate discovery, was making production tests. From perforations at 9932-42 and 9960-90 feet the well flowed at the rate of 5 barrels of oil hourly through 7/32-inch choke with tubing pressure 1600 pounds. Prior to this test perforations at 10,380-440 feet were acidized with 500 gallons and flowed gas with 500 pounds pressure and shutin pressure of 2900 pounds.

Harris County: Union Producing Company's Goodykoontz 1-A, extension test on the northeast side of Fairbanks field production, set 7-inch casing on bottom in preparation for production tests. Details have not been released but it is reported that a producer has been indicated by a drill-stem test made prior to setting casing.

• South Louisiana

Production Pipe Set in Texas' East Cameron Parish Wildcat

Casing set in East Cameron Prospect wildcat; 2 holes on Longville field east side plugged; Gulf to sidetrack in Bully Camp southeast flank test.

Cameron Parish: Production pipe has been set in The Texas Company's Miami Corporation 4, wildcat on the East Cameron Prospect in 13-14s-12w. Hole was drilled to 11,669 feet and plugged back to 5575 feet when nothing of commercial value was indicated at deeper levels. Perforations were made at 5536-40 feet for initial test. This wildcat is 1 mile north of the company's Lutcher-Moore 1 dry hole and 4½ miles northwest of Mud Lake gas-condensate production.

Beauregard Parish: Two dry holes have been drilled on the east side of Longville field production. Barnsdall Oil Company's Long-Bell Lumber Company 5-B, in 32-5s-9w, and 3000 feet northeast of No. 4-B, has been abandoned at 8825 feet. Barnsdall's Powell 1, wildcat 2½ miles southeast of Longville field production and in 10-6s-9w, has been abandoned at 9200 feet. Production in the Longville field is from the 8100 and 8550-foot levels.

Lafourche Parish: At Bully Camp field Gulf Refining Company was preparing to sidetrack and drill a directional hole at Delta Securities Company 18, outpost 4100 feet southeast of production and in 35-19s-21e. Total depth of the original hole is 7098 feet. A production test was made at 6988-97 feet where the well gauged 492 barrels per day through 5/32-inch choke with gas-oil ratio 858/1, but went to salt water.

Salary Hike Announced

Employes of Standard Oil Company (Ohio) and subsidiaries, Sohio Petroleum Company and Sohio Pipeline Company, will receive a further salary increase of 3 percent, making the total 18 percent, in the special temporary wage adjustment checks for August, September and October, according to W. T. Holliday, president.

Needed: A Bookkeeper!

We have always thought it would be very interesting—and revealing—to look over a federal trial balance and operating statement prepared by an honest bookkeeper in possession of all the facts. We are not impressed by recent news about "the biggest treasury surplus in history." We have a hunch that too many current items have been charged to prepaid expense, and too many accounts payable shoved back in a pigeonhole. If you ask us, we're being softened up for further aid to poor old England. She wanted Socialism, you know, and got it, including higher pay and shorter hours.

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• North Louisiana

Union Parish Wildcat Is Disappointment in Test

Union Parish wildcat has disappointing drill-stem test; several wildcats nearing 10,000-foot zone.

Union Parish: Pan-American Production Company's Elva Rugg 1, wildcat in C NE SE 31-20n-1w, now drilling below 6100 feet, took a drill-stem test of the 4829-68-foot zone and recovered salt water cut by gas, and gas-cut mud.

De Soto Parish: Skelly Oil Company's deep test, Thelma Nash 1, SW NE 20-12n-16w, north flank of the Logansport field, was drilling at 9875 feet in shale.

Claiborne Parish: Hassie Hunt, Trustee's wildcat, G. W. James 1, 10-22n-4w, 4 miles east of Summerfield, is drilling below 8614 feet.

Webster Parish: Hunt Oil Company's Haynesville Merchandising Company 1, 9-23n-9w, wildcat 3 miles west of Haynesville field, is below 9611 feet.

LaSalle Parish: Placid Oil Company's Louisiana Central 126, wildcat in C NE NE 15-10n-4e, is drilling below 5127 feet.

H. L. Hunt was rigging up for an 8000-foot test, Nebo Oil Company F-137, C SE NW 20-9n-4e, near Jena townsite. Hunt abandoned Nebo Oil Company A-49, 10-7n-3e, deep test in the Nebo field, at 8425 feet. There were no shows.

• Arkansas

Wildcat Activity Declines as Three Tests Quit, Two Begin

Wildcat activities decline as 3 tests abandoned and only 2 locations staked; 3 wildcats still drilling.

Arkansas County: D. J. Flesh et al abandoned Florence L. Rosencrantz 1, C NE SE SE 2-3s-6w, at 3633 feet. There were no shows.

Ashley County: McAlester Fuel Company abandoned Crossett Lumber Company E-1, C SE SE 1-17s-7w, fifth wildcat drilled by this operator on the Crossett fee. Total depth was 3808 feet.

Desha County: The Carter Oil Company's wildcat, Lewis Isom 1, C SE SW 33-9s-1w, topped Nacatoch at 4158 feet and is drilling below 4185 feet.

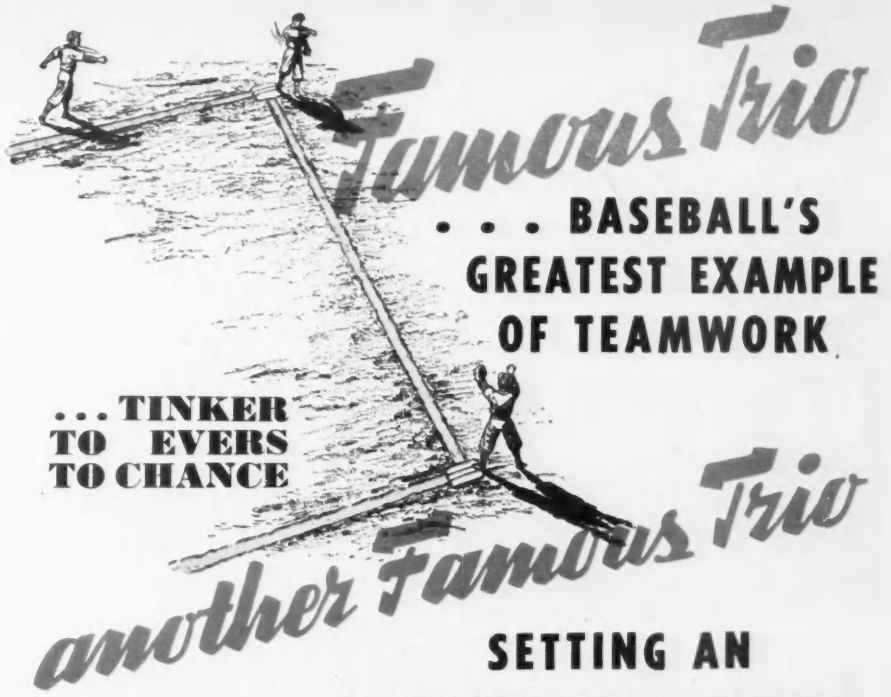
Calhoun County: E. C. Johnston spotted Freeman Smith Land Company 2, wildcat in NEc SE 31-14s-15w, 5 miles northeast of the Smackover field.

Jefferson County: John A. Stassi and Frank Stratton's wildcat, W. S. Stratton 1, C NE SW SW 25-6s-9w, is drilling below 4280 feet.

Little River County: Frank and George Frankel's Pearl Witherspoon 1, C SE NW SE 21-12s-30w, wildcat, is drilling below 2410 feet in shale.

Miller County: Big Chief Drilling Company and Glasscock Drilling Company abandoned Alziena N. Froid 1, C NW SE NW 29-17s-27w, at 6005 feet. Basal massive anhydrite was topped at 5445 feet and the James logged at 5944 feet.

Washington County: Basin Oil Company staked the second wildcat location, Joe Dawdle 1, C NE 17-18s-1w, as part of the search for oil being made around the Monroe uplift and Sharkey platform.



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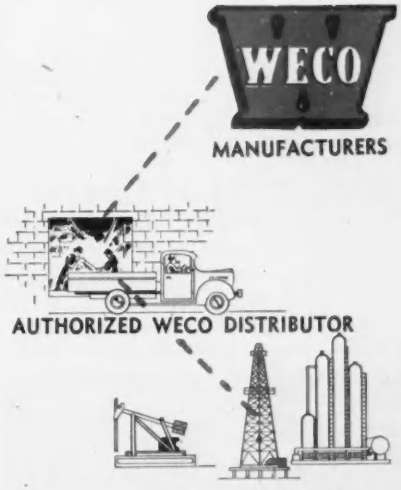

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• Mississippi

Jasper County Soso Gas Field Gets Another Good Producer

Soso gas field gets another good producer; third Jones County prospect looks good.

Jasper County: Union Producing Company's Massey Unit 1, SWc, NW 28-10n-13w, has been successfully completed in the Soso field. The well was drilled to 6666 feet, and after perforating opposite the Christmas sector of the Eutaw below 6664 feet, production was established with an initial flow of 31 million cubic feet of gas per day on open flow. In the East Heidelburg field, Danciger Oil & Refining Company's C. J. Simmons 1, NEc 36-1n-12e, which is drilling below established productive levels, has run extensive core tests of the lower Cretaceous zones at 7666-8444 feet. Cores recovered sand with no shows reported. Driller is currently working below 8792 feet.

Jones County: Gulf Refining Company's W. W. Jackson Gas Unit "A" 1, which is drilling across the county line in the Soso gas field, was preparing to complete after establishing production in the Eutaw zone. Casing was perforated at 6667-76 feet and on partial test the well flowed at the rate of 2,006,952 cubic feet of gas and 60 barrels of 67.5-gravity condensate per day.

Union Sulphur Company's A. E. Fall Estate 1, NWc 8-9n-10w, second of the company's 2 tests in the northern part of the county is drilling below 7010 feet after encountering encouraging shows of oil in several sections of the Eutaw zone. First drill-stem tests at 5408-18 feet yielded 30 feet of oil and oil-cut mud in a 20-minute interval. A subsequent test of the same section recovered 90 feet of mud cut with heavy oil. No shows have been indicated below that point in the Tuscaloosa or Massive sand zones. Gulf's L. L. Majors 1, SEc NE 29-6n-11w, deep wildcat, was preparing to set 5½-inch casing after running into trouble with stuck drill stem at 13,157 feet. Last shows were indicated in cores at 13,151-52 feet where shaly sand with oily odor was noted. Cores at 13,152-57 feet recovered salt.

Hinds County: Continental Oil Company's H. R. Bryant 1, wildcat in SE SE 9-5n-4w, is drilling below 7840 feet with no shows indicated in the lower sections of the hole. After topping chalk at 6755 feet, cores from 6723-7401 feet recovered shale, while those at 7401-63 feet recovered sandy shale. Only shows indicated so far were in cores at 5656-60 feet, where dead oil stains were noted.

Covington County: Humble Oil & Refining Company's Covington City Board of Supervisors 1, SWc 16-9n-17w, is running core tests below 5460 feet. Cores from 5446-56 feet recovered sand with no shows.

Amite County: Gulf's J. A. Rowland Tr. "A" 2, 29-4n-2e, deep test, is drilling below 11,497 feet. Cores from 11,386-88 and 11,388-93 feet recovered gray-green shale with no shows indicated. No shows have been reported at any point in the hole.

Alabama

Nelson Exploration Company's Smith Lumber Company 1, NWc 26-8n-16e, Crenshaw County, was drilling at 4460 feet. With Eutaw topped at 2166 feet and Tuscaloosa at 2590, both sections were cored with no shows indicated.

Fayette County: Amerada Petroleum Corporation's D. H. Wright 1, NW SW 8-15s-10w, was drilling below 3560 feet with no shows reported.

Florida

Hunt Oil Company's Gehew-Linton 1, C NE NE 30-3n-17w, wildcat in Walton County, was running core tests below 5515 feet. No shows have been reported.

Collier County: Humble Oil & Refining Company's Gulf Coast Realty Company 11, C N½ NWc SW 20-48s-30e Sunniland field, is drilling below 11,436 feet. A drill-stem test at 11,393-425 feet recovered oil-cut mud and oil-cut salt water.

Suwannee County: Sun Oil Company's J. H. Tillis 1, SE SW 28-2s-15e, is drilling below 1575 feet in a test that may go to approximately 5000 feet.

Michigan Leases Sold

Oil operators paid an average of $1.09 an acre for 42,584 acres of leases on state-owned lands at the August auction conducted by the Lands branch of the Michigan Conservation Department. The Carter Oil Company was the biggest single buyer at the sale and also set the sale high for a single lease, paying $32.50 an acre for a 40-acre lease in 15n-18w, Oceana County.

• Ohio

Corning Field, Knox County, Is Given Good Clinton Well

Good well found in Corning field; Big Prairie extended; Blue Rock wells deepened; southwest extension given Sayre; Mifflin wildcat is failure.

Knox County: Shuff and Bucy moved ½ mile south of the Ray Earlywine 1 and brought in a good Corning Grade well at Ora Johnson 1, NE NE 14 Jackson township. The Clinton sand came in at 2948-3000 feet with the pay in the upper part. The well was shot and made 133 barrels in 24 hours.

Holmes County: The Ohio Fuel Gas Company's Ella Sprang 1, SE SW 29 Ripley township, east offset to Huston 1, came in at 625,000 cubic feet of gas natural. Clinton sand at 3205-57 feet paid off in the last 6 feet.

Muskingum County: The National Gas and Oil Corporation moved in to drill Clinton sand wells in the northwest part of Blue Rock township to the Medina sand. Two have been completed with satisfactory results. Frank Mitchell 1, SW SE 9, made 70 barrels in 48 hours after shot and H. S. Barricklow 1, SE SE 9, made 35 barrels in 24 hours after shot.

Perry County: Charles Beatrice et al drilled in Minnie Beatrice 1, SE NW 28, Pleasant township, with an estimated open flow of 500,000 cubic feet in the Medina sand at 3845-55 feet. Clinton sand at 3732-72 feet had only a showing of gas.

Richland County: Ditch and Bashford drilled through the Medina formation in an attempt to find gas 2 miles west of the field in Mifflin township. The test is Leila Boales 1, SE SW 9, and was drilled to 2437 feet without finding any Clinton sand.

• Michigan

Nine Wildcats Are Planned; Kimball Lake Flank Indicated

Nine of 22 permits approved by the State Conservation Department for the week of August 23 call for exploratory tests. Three are for the central basin and 6 for the western and southwestern shallow area. Sun Oil Company received 5 of the permits, including 2 wildcats.

Newaygo County: With latest completions pointing to the probable north flank of the Kimball Lake pool, drilling operations are expected to level off shortly in the play. New completions boosted the field total of flowing or pumping wells to 57. Eight rigs are running.

Oceana County: Gas of unestimated volume was encountered by The Carter Oil Company at Blohm 1, NE NE NE 16-13n-18w, farthest west well in the Stony Lake pool, at 950 feet in the Berea horizon, 700 feet above the Traverse lime oil beds. The gas pay caused a troublesome blowout.

Proration: The Kimball Lake field, Newaygo County, will be brought under a permanent 75-barrel per day per well state proration and both the Reed City and Fork fields will be removed from proration as the result of action taken by P. J. Hoffmaster, state well supervisor, on recommendation of the Oil Advisory Board.

The supervisor, under his emergency powers, had reduced the Kimball Lake allowable from 100 to 75 barrels per well in mid-August, following a survey that reportedly showed a rapid drop in reservoir pressure. There was no direct opposition voiced from operators in the field to the reduction, although Sun, biggest single operator in the field, proposed the reduction be brought down to 50 barrels per day. Sun has just completed negotiations to construct a $250,000 casinghead gas plant in the field to supply gas to Muskegon, Mich., industries.

Removal of proration in Reed City and Fork was purely a matter of "paper saving." For some time the fields have been below the limitation levels of state proration allowables.

• Illinois Basin

Vanderburgh County, Indiana, Discovery May Be Important

Vanderburgh County, Indiana, discovery may be important; Kentucky discovery placed on pump; Marion County, Illinois, discovery reworked for increased production.

Indiana

The discovery of what may prove an important pool just northwest of Evansville, Vanderburgh County, is Calvert and Willis' Egli 1, NE SW SW 2-6s-11w, approximately 5 miles northeast of the Vernon Heights pool. The well was completed natural for 165 barrels of oil in 24 hours from Pennsylvania sand at 875-96 feet. The same operators have pipe set for 2 more wells in the area and were moving in equipment for another, while another operator also was moving in equipment.

Kentucky

Mitchell and Thorne's Kellin 1, 17-P-21, Henderson County, approximately a mile north of the Hitesville pool, was being placed on pump after flowing 40 barrels of oil hourly from McClosky lime for 8 hours. Pay was found at 2632-36 and 2648-52 feet and was treated with 4000 gallons of acid.

Illinois

J. J. Lynn's Messman 1, NW NW SW 9-2s-14w, Edwards County, 2 miles of the Albion pool, swabbed 105 barrels of oil in 24 hours from Aux Vases sand at 2950-70 feet while testing after a 185-quart shot. Bethel sand at 2827-37 feet was still to be tested.

Marion County: J. H. Gilliam's Ebe 1, NE NE NW 14-2n-4e, discovery well of the Iuka pool, has been reworked and recompleted for increased production. Originally the well was completed for 150 barrels of oil daily in the St. Louis lime at 2874-78 feet. In the rework job, operators tested McClosky lime through casing perforations at 2752-56 feet and increased the well 150 barrels of oil daily. McClosky was treated with 1000 gallons of acid before the completion.

Ben Taylor's Sebastian 1, wildcat in NW NE SW 21-1n-2e, has been completed for 9 barrels of oil and 27 barrels of water daily from Benoist sand at 1917-31 feet.

Shelby County: Paul Doran's Manning 1, NE NW SW 14-11n-11e, 9 miles northeast of Stewardson pool and a mile northeast of the 1-well Shelbyville pool, swabbed 2 barrels of oil hourly after plug was drilled to the Aux Vases sand at 1866-903 feet. The well was given a 50-quart shot prior to additional testing.

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• California

Long Beach Tidelands Drilling Program Started by Richfield

Richfield Oil Corporation starts 75-100 well program on Long Beach tidelands; outpost tests north of Edison field in Kern County has good indications; Paloma completion flows 51-gravity oil; gas discovery in Salt Creek field flows 43-gravity oil; swabbing in Ten Section field deep test produces little fluid; new pay discovered in Santa Barbara County.

Los Angeles County: The Long Beach board of harbor commissioners has approved Richfield Oil Corporation's drilling contract with Loffland Brothers Company for the first wells to be drilled under the contract which the city of Long Beach recently awarded to Richfield for development of 245 acres of city-owned tidelands. Tentative plans provide for the ultimate drilling of 75 to 100 wells.

The area covered by the lease, known as Parcel A, is roughly triangular in shape and extends from the east side of the flood control channel to Pine Avenue and then about 4300 feet seaward. The first 4 wells, designated as A-31, A-47, A-64 and A-85, will be bottomed in the Lower Terminal, Ranger, Lower Terminal and Upper Terminal zones in the order named.

The Aurora Corporation, which recently acquired from Shell Oil Company its Braille Institute lease and 1 small pumper in the Newhall area, will undertake additional development work. A second well will be drilled immediately about 1 miles southeast of Newhall.

H. C. Christie's Johnson 1 in the Alondra area, 22-3s-14w, has been abandoned at 9351 feet. All tests were wet.

Kern County: Caliente Oil Company's John J. 1, outpost about ¾ mile north of production in the Edison field, 12-30s-29e, was reported to have had interesting showings on the electrical log. Top of Edison shale was cored at 4515 feet and top of the Olcese at 5115. Cores have been taken almost continuously down to 5500 feet. A producer here would upset some existing geological theories on this area.

Pacific Western Oil Corporation has completed an unusually good well on its Noel Fee lease, northwest flank of the Paloma field, 29-31s-26e. Operator's Noel Fee 76 was completed flowing 360 barrels of 51.5-gravity clean oil through 15/64-inch choke and 2,200,000 cubic feet of gas.

On the northeast flank of the field in 1-32s-26e, Western Gulf Oil Company has located 5 wells on its Los Angeles Athletic Club lease.

Rothschild-Bender Oil Operations Sheep Springs 8 gas discovery in the Salt Creek area of the Cymric field, 17-29s-21e, has gone to oil and is currently flowing 250 barrels of 43-gravity oil and an estimated 2 million to 5 million cubic feet of gas through 18/64-inch choke. On the other hand, Union Oil Company's Miller & Lux 77-20 in Sect. 20 has been completed flowing all gas through 12/64-inch choke from 2801 feet. Union is deepening the well.

Outposts continue to be drilled in an endeavor to extend production in the Lost Hills field. The Superior Oil Company staked U.S.L. 2 in 18-26s-21e and Bankline 4 in 19-26s-21e on the northeast flank of the field.

Tests at 13,366-14,000 feet in Shell Oil Company's K.C.L.-A. 53-30, a deep Vedder test in the Ten Section field, showed very little fluid entry and the operator is perforating a higher interval for further tests. Objective is production in the Vedder horizon below the presently productive Stevens sand.

Fresno County: Lowry Lytle will drill a wildcat about 5 miles northwest of production in the Raisin City field, 36-14s-16e. Well will be drilled on acreage of Petrol Corporation. Other operators with adjoining acreage are Chanslor-Canfield Midway Oil Company, Seaboard Oil Company, which recently drilled a dry hole 1 mile southeast, Superior and Pacific Western. If oil is found in paying quantities it will be the farthest north commercial production in California. Objective is the Wheatville horizon expected at about 6400 feet.

Santa Barbara County: Sunray has made a new zone discovery in the new productive area 1 mile southeast of the Orcutt field. Los Flores 2 flowed mud and 31-gravity oil by heads at an estimated 200-barrel rate from 4390-510 feet.

• Rocky Mountain Area

Wildcat on Overland Dome, Wyoming, Has Oil in Dakota

Overland Dome structure, Wyoming, wildcat finds oil in top of Dakota; East Antelope wildcat may be abandoned; Ant Hills extension completed; General Petroleum may have Third Frontier discovery in Washakie County; Moffat County, Colorado, wildcat to be perforated and tested; Montana wildcat quits.

Wyoming

On the Overland Dome structure, Union Oil Company of California's Government 1, SE NE NE 22-20n-84w, Carbon County, found some oil in the top of the Dakota sand. Dakota was logged at 6087 feet and on drill-stem test at 6085-129 feet the well made 480 feet of oil- and gas-cut mud in 37 minutes. On test at 6119-51 feet the well made 1840 feet of water in 30 minutes. The operator is now fishing at 6151 feet, total depth. This structure has had several Dakota tests by wells east and southeast of the present test but no commercial production has resulted.

Fremont County: Continental Oil Company and General Petroleum Corporation were about to abandon Unit 1, wildcat in NW SW SE 26-27n-93w, East Antelope structure, south of the Crooks Gap field. The well is drilling below 5125 feet, probably still in Tertiary, but correlations with nearby wells indicate it is not sufficiently high to justify deeper drilling. A gas pocket was logged in the well at 1360-66 feet with an initial volume of approximately 15 million cubic feet daily. However, the pressures declined immediately, the well was killed, and the zone was established as non-commercial.

Niobrara County: The Arrow Oil Company is completing its Ant Hills extension well, Wasserberger 1, SW NE SW 1-37n-63w, 4 miles north of production, for an initial of 104 barrels of oil per day from the Newcastle (Muddy) sand at 4725-32 feet. The oil is of 42 gravity, and considerable drilling is anticipated on the structure as a result of the extension test.

Park County: General Petroleum Corporation's deep test of the Badger Basin field at Badura 2, C NE NW 7-57n-101w, near the Wyoming-Montana state line, has reached the objective Tensleep sand and was coring. Top of Tensleep was tentatively placed at 11,023 feet and the sand is extremely hard and tight with no saturation reported. This is the first test below the Sundance in the field, which produces 900 barrels of 42-gravity oil daily from the Frontier horizon at around 9000 feet.

Washakie County; General Petroleum may run casing at its Sand Creek wildcat in the southeastern section of the Big Horn Basin for a Third Frontier sand discovery well. The well is No. 45-26-G, NE NE SW 26-46n-91w, and Third Frontier was topped at 6690 feet. On drill-stem test at 6692-728 feet the well produced gas at the rate of 750,000 cubic feet per day with an estimated 445 barrels of oil daily. The tester was open approximately 38 minutes. No official estimate of production has been released and the well is being drilled to the base of the sand, expected within the next fifty feet, before decision is made whether to complete in the present horizon or deepen to lower objectives. In April the company completed a discovery on the South Fork structure, 4½ miles west of the new well on Sand Creek. This test made 210 barrels of 28.6-gravity oil daily on pump from the Embar formation, 10,046-125 feet, after being drilled into Madison at 10,900 feet, total depth. Drilling at both Sand Creek and South Fork came as a result of seismic exploration made by General Petroleum 3 years ago.

Colorado

Casing has been run by The Carter Oil Company on the North Craig wildcat at Unit 1, C SE SE 39-8n-90w, Moffat County, and the well will be perforated and tested in zones which showed saturation on drilling. Total depth of the well is 9000 feet. Top of the Mesaverde was logged at 5286 feet and on drill-stem test at 7942-50 feet, gas was recovered in 2 minutes and 30 feet of oil and gas-cut mud showed in 1 hour. On a test at 7829-48 feet a total of 285 feet of fluid was recovered, with 30 feet of oil and the balance half oil and mud. This zone probably will be the first tested and may prove commercial. Frequent shows of gas were found in and above the Fort Union, topped at 2020 feet, and in the Lewis, found at 3126 feet. A large portion of this wildcat was cored and Carter made frequent drill-stem tests.

Montana

Union Oil has abandoned State 1, 36-36n-7e, Liberty County, near the Canadian border, and east of the Bears Den area. The wildcat went to 2293 feet, total depth, and found water in the Bow Island sand.

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EXPLORATORY FAILURES

ARKANSAS WILDCATS

Arkansas County: D. J. Flesh et al's Florence L. Rosencrantz 1, c ne se se 2-36-6w, Wilcox 560, Midway 2253, Nacotoch 3024-3169, Chalk 3233, base Annona 3350, Paleozoics 3464, abnd 8-13-47 at 3633.

Ashley County: McAlester Fuel Co.'s Crossett Lbr. Co. E-1, c se se 1-17s-7w, Gas Rock 2872, abnd 8-15-47 at 3808.

Miller County: Big Chief Drlg. Co.-Glasscock Drlg. Co.'s Alziena N. Froid 1, c nw se nw 29-17s-27w, base Massive Anhydrite 5445, James 5944, abnd 8-20-47 at 6005.

CALIFORNIA WILDCATS

Los Angeles County: H. C. Christie's Johnson 1, 22-3s-14w, Alondra area, abnd 8-15-47 at 9351.

Monterey County: Texas Co.'s Orradre 1, 31-23s-11e, Los Lobos area, abnd 8-15-47 at 3795.

Yolo County: Shell's Heinz Unit 1, 20-8n-1e, Winters area abnd 8-18-47 at 5300.

FLORIDA WILDCAT

Okaloosa County: R. T. Adams' B. H. Hart Jr. 1, c ne ne 5-4n-22w, Chalk 2815, Eutaw 4065, abnd 8-14-47 at 5505.

ILLINOIS WILDCATS

Clay County: W. R. Tuley & J. W. Carter's Woods 1, ne sw ne 17-4n-7e, abnd 3025.

Clinton County: C. R. Winn et al's Huber 1, nw sw se 36-3n-1w, abnd 1526.

Edwards County: Burr Lambert's Souey 2, ne sw se 21-1n-10e, abnd 3356.

Gallatin County: Pure's Logsdon 1, nw sw sw 22-9s-10e, abnd 2800.

Jefferson County: B. W. Vinson's Collier 1, nw nw nw 21-3s-3e, abnd 2892.

Jasper County: Nat. Assoc. Pet.'s Bohann 1, sw se sw 5-6n-8e, abnd 3120.

Lawrence County: Peter Gerasimos' Kelly 1, ne se 36-4n-12w, abnd 1926.

Madison County: Joe Kesl Jr.'s Kusmanoff 1, c w½ sw se 12-3n-9w, abnd 1687.

Shelby County: Nat. Assoc. Pet.'s Charles 1, ne ne nw 3-9n-5e, abnd 2186.

Wayne County: Don Slape's Callan 1, se nw sw 20-2n-9e, abnd 3190.

INDIANA WILCATS

Posey County: Diamond Oil Explor.'s Esche 1, ne nw nw 14-6s-13w, abnd 903.

Texas' Stevens-Knight 1, se sw sw 15-6s-13w, abnd 2980.

C. A. Lynch's Seward 1, sw se nw 16-7s-14w, abnd 2579.

Sullivan County: Ray Redifer's Sanders 1, ne ne se 17-7n-10w, abnd 869.

KENTUCKY

Hancock County: J. C. Ellis' Rice 1(2) 1150 fr nl, 4300 fr el, Qd. 1-0-33, abnd 1034.

NORTH LOUISIANA WILDCATS

Caddo Parish: Big Chief Drlg.-D. A. McCrary's Slattery A-1, 2970 fr sl 330 fr wl 15-19n-15w, abnd 8-23-47 at 2590.

Madison Parish: Murphy-Sun's Mahony Core Test 1, nw nw 11-7n-10e, abnd 8-15-47 at 3500.

Natchitoches Parish: G. H. Neighbors' Anderson 1, ne sw 17-10n-10w, 1½ mi se Ajax fld, abnd 8-19-47 at 3422.

Sabine Parish: Harold H. Duck's Peavy-Wilson 1, c se sw 31-8n-13w, Fredericksburg 3470, abnd 8-20-47 at 5910.

Union Parish: L & M Drlg. Co.'s M. E. Compton, Jr., 1, c sw sw ne 2-21n-1w, 3 mi s Ora fld, abnd 8-18-47 at 2501.

NORTH LOUISIANA NEW PAY TEST

LaSalle Parish—Nebo Field: H. L. Hunt's Nebo Oil Co. A-49 330 fr wl 1830 fr sl 10-7n-3e, abnd 8-22-47 at 8425.

SOUTH LOUISIANA WILDCAT

Beauregard Parish: Barnsdall Oil Co.'s Powell 1, swc 10-6s-9w, 2½ mi se Longville prod, abnd 8-25-47 at 9200.

MICHIGAN WILDCATS

Allegan County: Wadsworth & Cook's Allegan 1, nw sw ne 5-12n-13w, Traverse 1523, abnd 8-19-47 at 1533.

L. C. Green's Brussow 1, nw nw ne 29-3n-13w, Traverse 1746, abnd 8-22-47 at 1780.

Barry County: Louis Zeelman's Bowen 1, ne ne sw 6-3n-10w, Traverse 1856, abnd 8-21-47 at 2033.

Clare County: Sohio-Lupher's McKay 1, se nw sw 33-18n-4w, abnd 8-21-47 at 1802.

Kent County: Sun's Carlson 1, sw sw sw 14-9n-10w, Traverse 2585, abnd 8-21-47 at 3035.

Osceola County: Sun's Richardson 6, s½ nw se 10-18n-9w, Dundee 3946, abnd 8-13-47 at 4065.

MICHIGAN OUTPOST

Oceana County-Stony Lake: Neil Wagnaar's Fulljames 1, ne se sw 12-13n-18w, Traverse 1677, abnd 8-19-47 at 1725.

NEW MEXICO WILDCATS

Chaves County: Richfield Oil Corp. et al's Mullis-Federal 1, c se sw 21-15s-29e (OWDD) td 5675, elev 3809, San Andres 2365, Glorietta 3835, Clear Fork 5190, Abo 6150, Mississippi 10,260, Devonian 10,890, Silurian 11,000, Montoya 11,400, Simpson 11,650, Ellenburger 11,722, granite wash 12,115, granite 12,148, abnd 8-20-47 at 12,153.

Guadalupe County: Henderson & Knowles' Branch 1, 2310 snl 1650 wel 3-10n-25e, elev 4668, abnd 8-20-47 at 1038.

Lea County: Tide Water's Marshall 1-D, c se ne 13-21s-36e, elev 3535, San Andres 4030, Glorietta 5290, Tubb 6480, abnd 8-18-47 at 7087.

NEW MEXICO NEW PAY TEST

Lea County-Monument: Mid-Continent's Reeves 2, 440 out of nwc 29-20s-37e, offset regular Permian prod, elev 3527, Yates 2680, Glorietta 5300, Yeso (Tubb) 6550, abnd 8-19-47 at 7150.

OHIO WILDCATS

Muskingum County: Four Way O&G Co.'s C. W. Tumblin 1, nw ne 11 Salt Creek, abnd 8-11-47 at 4507.

Richland County: Ditch and Bashford's Leila Boals 1, se sw 9 Mifflin, abnd 8-20-47 at 2437.

EAST CENTRAL TEXAS WILDCATS

Denton County: Russell Maguire et al's Waide 1, 330 out swc A. H. Lynde Sur, elev 655, junked 8-10-47 at 1278.

Hill County: Dalton J. Woods et al's Estes 1, 330 fr nwl 400 fr nel of 161.7-ac tr, in cor blk 24, Tyler CSL, abnd 8-15-47 at 1250.

NORTHEAST TEXAS WILDCATS

Anderson County: Continental-Byrd & Frost's Royall 1, 1230 ewl 1291 nsl J. Crawford sur, elev 384, base Wilcox 2810, Pecan 4113, Austin 4914-5110, Woodbine 5148, Georgetown 5823, Goodland 6415-6675, Glen Rose 6805, massive anhydrite 7910-8000, James 8360, Pettit 8506, Travis Peak 8720, abnd 8-23-47 at 9388.

Shelby County: L. E. Winslow's Lilly 1, 1630 se of nwl 3600 w of ely el of C. C. Tutt sur, Navarro 2381, Saratoga 2410, 1 Taylor shale 3340-70, abnd 8-1-47 at 4020.

NORTHEAST TEXAS NEW PAY TEST

Wood County-Quitman: Shell's Goldsmith 12, 1750 nsl 400 wel Ed. Goodsir Sur, elev 428, Georgetown 4996, Paluxy 6246, Massive Anhydrite 7670-7770, Gloyd 7963, Young 8055, Travis Peak 8380, Cotton Valley 9762, salt plug (in sidetracked hole) 11,158, td in salt 11,283, pb, pump fr 1 Eagleford perf 4263-75, comp 8-16-47.

SOUTH CENTRAL TEXAS WILDCATS

Bexar County: C. Hughes Thomas' H.R. & S.C. Elleson 1, 350 w alg nl fr nec T. Davidson Sur 200 th 1500 n at ra, in H. Muerer Sur 539, abnd 8-9-47 at 410.

Dimmitt County: Texas Co.'s Ethel Richardson et al 1, 448 fr swl 2988 fr nwl H&GN Sur 5, abnd 8-18-47 at 4015.

SOUTHWEST TEXAS-LOWER COAST WILDCATS

Duval County: Santa Clara Oil Co.-John F. Camp & Sons' Jas. F. Welder Hrs. 1-E, 1575 e of wl 800 nw fr interior cor 1000-ac "E" lse, M. F. Andros Sur 24, abnd 8-18-47 at 4810.

Texon Roy. Co.'s Mariano Valdez 1, 330 fr swl 1650 fr sel Sur 353, 1 mi n ne Cam fld, abnd 8-15-47 at 3300.

Nueces County: Monday Oil Co. et al's Eugenia Walsh 1, 330 sw of nel lot 22 and lse 330 nw sel 143-ac lse in lots 20, 21, 22, Sect 53, Rincon de Corpus Christi gr, 1 mi sw E. Flour Bluff, abnd 8-14-47 at 7500.

Webb County: Ray de Lay's J. E. Neal 1, 330 fr s&el e½ J. E. Neal Sur 1008, 320-ac lse, abnd 8-8-47 at 2200.

SOUTHWEST TEXAS-LOWER COAST OUTPOST

Starr County-N. Sun: Sun's I. V. Montalvo 4-B, 1000 fr el 5750 fr sl Los Retacho Gr and 3870.13-ac "B" lse, 3745 w ne nw extn well in se extn area, 3327 e ne dry hole, abnd 8-14-47 at 6003.

MIDDLE TEXAS COAST WILDCATS

Bee County: Magnolia's W. E. Erp 3, 1980 fr nwl 1320 fr swl 1349.7-ac lse, N. Recendes Gr, abnd 8-17-47 at 3300.

DeWitt County: Stanolind's L. T. Burns 1, 330 fr el 990 fr nl Jas. Clark Sur, abnd 8-14-47 at 9019.

Goliad County: H. R. Smith-W. C. McBride's Abraham Garza 1, 660 fr sl 467 fr el 119.6-ac lse, Victor Blanco Gr, abnd 8-16-47 at 9024.

Jackson County: Humble's E. C. LeBauve et al 1, 660 fr nl, 1380 fr wl 900-ac lse, Hugh McGuffin Sur, abnd 8-20-47 at 10,000.

Victoria County: A. W. Crosby's A. R. McGehee 1, 4350 fr nel 1950 fr sel A. Waldemeyer Sur, abnd 8-20-47 at 4751.

UPPER TEXAS COAST WILDCAT

Newton County: Hinkle Drlg. Co.s White & West 1, 6612 fr wl 7387 fr el 700 fr sl Robert Goodwin Lge, S. Call area, abnd 8-10-47 at 8365.

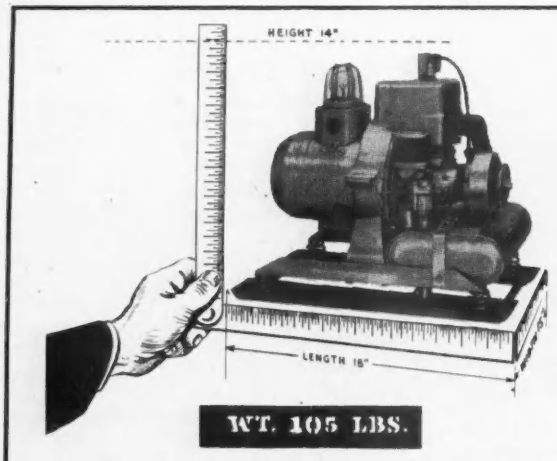
WEST VIRGINIA WILDCAT

Greenbriar County: Texas Co.'s G. R. Dean 1, Corniferous chert 6431, Oriskany 6538-72, Williamsport 7458-7550, Tuscarora 7988-8120, abnd 8-16-47 at 8020.

WYOMING WILDCATS

Albany County: Front Range Drlg.'s Gov't 1, ne nw sw 10-13n-76w, Schmidt area, Sundance 200, Casper 1288, abnd 8-1-47 at 1300.

Fremont County: Sinclair Wyoming's Unit 1, sw ne nw 24-27n-101w, Oregon Trail, abnd granite boulders, abnd 8-16-47 at 1858.



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MEN IN THE INDUSTRY NEWS

E. R. Turner

E. R. Turner of Houston was elected president and a member of the board of directors of Pan American Production Company, Pan American Pipe Line Company and Pan American Gas Company August 27 at New York City. He succeeds **D. J. Smith,** recently named president of Pan American Petroleum and Transport Company. **Harold Decker** was named vice president and general manager of Pan American Production Company and Pan American Gas Company, and **Ira O. Walker** was chosen vice president and general manager of Pan American Pipe Line Company. **E. T. Martin** was named assistant secretary of the production and gas companies. Turner joined Pan American in 1935 and as general manager went to Houston from Oklahoma to activate Pan American Production Company. He was made vice president of Pan American Production and Pipe Line companies in 1939 and upon the organization of Pan American Gas Company in 1941, also was made a vice president of that firm. He was elected first vice president of the three companies on January 1, 1945.

»

John M. Vetter, superintendent of the Land and Geological Department of Pan American Production Company, succeeded Decker as assistant manager of that company and of Pan American Gas Company. **Alfred W. Lott,** evaluation engineer of Pan American Production Company, was named assistant to the vice president and will be administrative aide to Decker. The Land and Geological Department of Pan American Production Department has been discontinued and the Exploration Department and Land Department formed. **G. J. Smith,** assistant superintendent of the Land and Geological Department, for Geology, has been chosen superintendent of the Exploration Department. **Haymond Willis,** assistant superintendent of the Land and Geological Department, for Land, has been appointed superintendent of the Land Department. **E. W. Krug** was named general superintendent for Pan American Pipe Line Company, succeeding Walker. **E. J. Tennyson,** division foreman for the pipe line firm's Southern Division, has been named superintendent of that division, succeeding Krug.

»

J. K. Petty, formerly with the Bureau of Economic Geology at Austin, has joined the firm of Schweer and Hardison at Wichita Falls, Texas.

»

Cecil Carey of Shawnee, Okla., **Carl B. Anderson** of Jackson, Miss., and **Edward Spiers** of Oklahoma City, have organized the Anderson-Carey Drilling Company capitalized at $150,000, with headquarters at Shawnee.

Robert W. McDowell

Robert W. McDowell, vice president in charge of sales for Mid-Continent Petroleum Corporation, was elected executive vice president, a newly-created position, August 22. McDowell was born August 9, 1895, in Anthony, Kansas. served in World War I, and entered the oil industry in 1918 as stenographer for Producers and Refiners Corporation in Tulsa. In 1922 he became sales manager of the firm and in 1924 he resigned to become vice president and general manager of Hawkeye Oil Company, Waterloo, Iowa. When that firm merged with Black Hawk Oil Company, also of Waterloo, McDowell became president of the consolidated organization. In 1927 Mid-Continent purchased the physical properties of Black Hawk and created a marketing division with McDowell as manager. In 1928 he was transferred to Tulsa as assistant to **D. W. Moffitt,** vice president in charge of sales, and in 1928 he became general sales manager for both the retail marketing and wholesale divisions. In 1930, at the age of 34, he was elected vice president in charge of sales, and in 1944 he became a director of Mid-Continent.

»

Willis Cullen Noble, J., has joined the Geological Department of Tennessee Gas Transmission Company of Houston as scout. He is a native of Lufkin, Texas, belongs to the National Oil Scouts and Landmen's Association, and previously was connected with Gulf Oil Corporation and Deep Rock Oil Corporation.

»

J. D. Gustafson, engineer for The Carter Oil Company at Mattoon, Ill., has resigned to join Imperial Oil Company at Calgary, Alberta, Canada. He has been succeeded in Mattoon by **Max C. Sons,** former division engineer at Billings, Mont.

»

Paul D. Torrey, consulting geologist, Houston, has been retained by the Interstate Oil Compact Commission to set up its national secondary-recovery study and survey. A full-time engineer will be employed later. Torrey is an authority on secondary-recovery work and pioneered in this field in the Alleghany and Bradford areas.

»

W. R. Shirk has joined the geological staff of Bay Petroleum Corporation at Wichita Falls, Texas. He formerly was with Cities Service Oil Company at Wichita Falls and more recently engaged in consulting work.

»

Eugene A. Wurster has been appointed assistant comptroller of Socony-Vacuum Oil Company, Inc. He succeeds **Riche H. Johnson,** who retired recently after 40 years of service. Wurster became associated with Standard Oil Company of New York in 1915.

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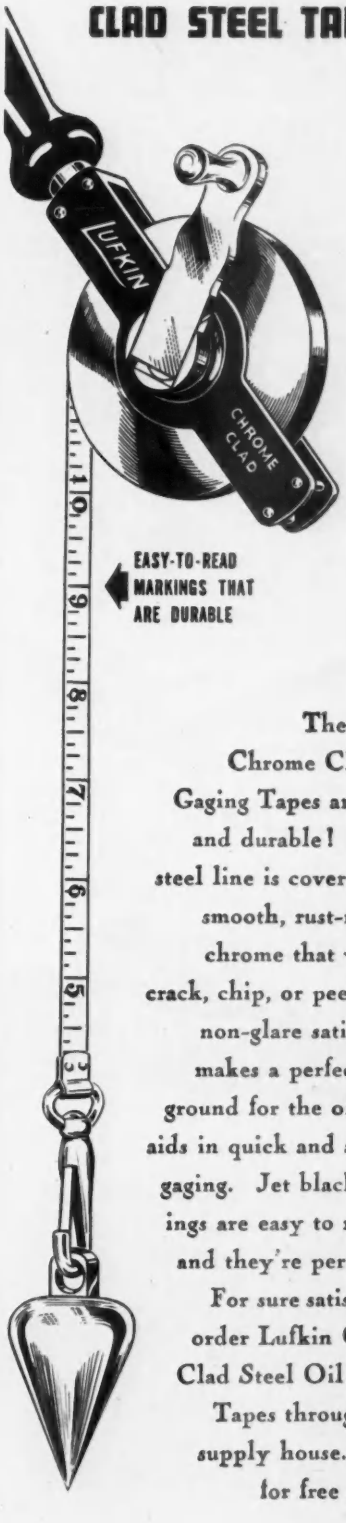

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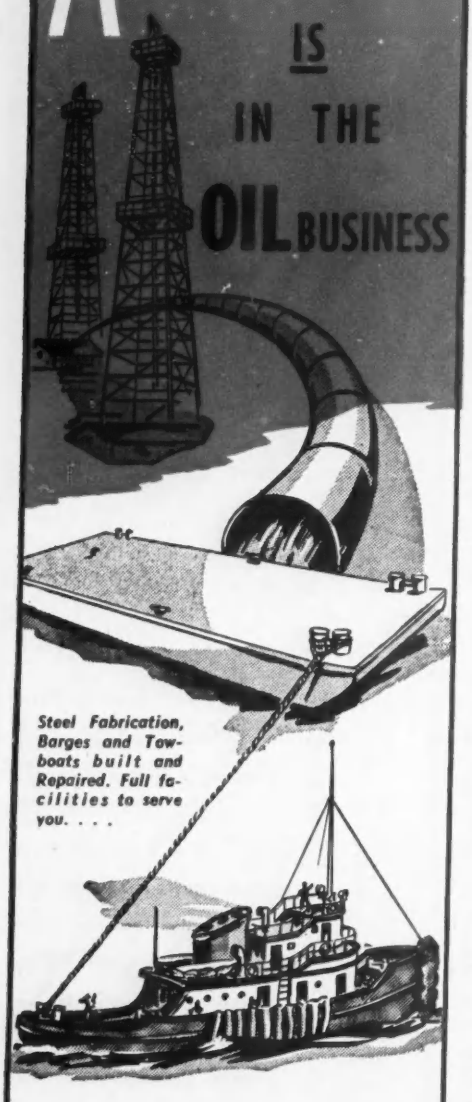

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J. D. Ball, Kelsey District superintendent at Encino, Texas, for the production department of Humble Oil & Refining Company, was transferred to Corpus Christi as Flour Bluff District superintendent. **Frank Bass** of Corpus Christi, Flour Bluff superintendent, was transferred to Encino as Kelsey District superintendent. **F. E. Meleen,** assistant district superintendent of the Avoca District at Avoca, Texas, has been promoted to district superintendent. **F. A. Jewell,** farm boss in the Vernon District, Vernon, Texas, has been transferred to the Avoca District and promoted to assistant superintendent.

»

James Boyd, former dean of the Colorado School of Mines, was sworn in August 27 as head of the Bureau of Mines. Boyd was appointed last March but confirmation by the Senate was held up in the rush of adjournment. Renamed by President Truman August 26, he will serve as a recess appointee subject to Senate confirmation after Congress returns.

»

E. P. Neal has taken over the duties of district geologist in the Tulsa area for Tide Water Associated Oil Company, succeeding **J. M. Clark,** resigned. Neal was Tide Water district geologist in Wichita, Kansas, for several years and for the last year and a half has been making regional studies in northwest Texas and the surrounding area. Before joining Tide Water he was in the production engineering department of Shell Oil Company.

»

Kenneth Edwards, micropaleontologist for Standard Oil Company of California at Taft, Calif., is leaving for Venezuela to join the staff of Richmond Petroleum Company, Standard subsidiary.

»

Rex Grivetti, who has been stationed at The Texas Company's Portland, Ore., geological office, has returned to California and will make his headquarters at Taft.

»

Verne O. Henderson has been named safety engineer for the pipe line department of General Petroleum Corporation.

»

I. J. Blackhall, Jr., is district representative at National Associated Petroleum Company's Rocky Mountain offices at Denver.

»

L. A. Weom has been named manager of the pump division for Fairbanks, Morse & Company, succeeding **Arnold Brown, resigned.** Weom joined the firm in 1929 as assistant in the Pump and Electric Department at St. Paul.

»

Albert Musschoot, a member of the general engineering staff of Link-Belt Company at Philadelphia, has been appointed assistant to the chief engineer, with headquarters at the company's general office, 307 N. Michigan Avenue, Chicago 1. In this capacity, he will be directly responsible to **Richard F. Bergmann,** Link-Belt vice president and chief engineer.

R. M. Freeman, store manager for Houston Oil Field Material Company in Midland, Texas, for the past 18 months, has joined the Atlas Engineering Works as West Texas-New Mexico representative. With offices at Midland, Freeman will handle all Atlas products, including the new Atlas-Hughes valves. He is a veteran of 22 years in the supply business.

»

Claude E. Davis has been named field engineer in the midwest for Goodyear Tire & Rubber Company. This is a new post in the field organization.

»

James E. Emrick will be representative for Standco Brake Lining Company in the Rocky Mountain territory, effective September 1. He will have headquarters in Casper, Wyo. For the past four years Embrick has been a resident of Casper, where he was factory representative for various manufacturers. During the previous nine years he was an engineer in Union Oil Company's drilling department.

Deaths

William D. Beaty, 54, engineer with Sinclair Prairie Pipe Line Company, died August 24 at Tulsa.

»

Patrick H. Mack, 95, former executive of Oil Well Supply Company, died August 22 at Bradford, Penn. Mack went to the Bradford oil fieds about 60 years ago and joined Oil Well. He improved on many tools used in drilling wells and during his long career received at least 70 major patents and many minor ones. He retired about 12 years ago when he was superintendent of the company's Bradford shops.

»

William V. Hartmann, 76, former vice president and director of Gulf Refining Company and Gulf Oil Corporation, died August 24 in Pittsburgh. Hartmann entered the oil industry in 1888 with Standard Oil Company and joined Gulf Oil Corporation as assistant manager of sales at Pittsburgh in 1903. He retired in 1946.

»

Curtis L. Henderson, 56, president of Vickers Petroleum Company, died August 26 at Wichita, Kansas, following an illness of several weeks. Henderson served on the Petroleum Industry War Council and was a member of the newly created National Petroleum Council. He had headed Vickers Petroleum since 1940 and was president of Western Petroleum Refiners Association from 1940 to 1946.

»

Logan B. Fain, 58, Jackson, Miss., oil man, died of a self-inflicted bullet wound.

»

Percy Jenkins, 47, hardware products sales manager, Wickwire Spencer Steel Division of The Colorado Fuel and Iron Corporation, died August 20. Jenkins joined Wickwire Spencer Steel Company in 1925.

Lee C. Moore Corporation Opens Export Office in New York City

Lee C. Moore Corporation of Pittsburgh and Tulsa has opened an export office in Room 572, at 50 Church Street, New York City.

George I. Lynch has been appointed manager. A graduate of the University of Pittsburgh, Lynch has been associated with Lee C. Moore for more than 20 years, having served in the engineering department in Pittsburgh before transferring to the sales division. He was located in company sales offices in Pittsburgh, Houston and New York.

George I. Lynch

Tuboscope Company Opens Branch Inspection Yard in Pittsburgh Area

The Tuboscope Company, oil field tubular inspectors, has announced the opening of a branch inspection yard in the Pittsburgh area to provide Tuboscope inspection services for buyers of tubular goods produced there.

In commenting upon their expansion to the East, J. W. Bozeman, assistant general manager of the company, pointed out that more and more operators are demanding Tuboscope inspection of new pipe before it is placed in service, and that the Pittsburgh yard has been established to enable oil operators to ship Tuboscope inspected pipe direct from the Pittsburgh area to field locations.

This service will be of particular benefit to operators in fields outside the U. S., according to Bozeman.

The Tuboscope Company maintains headquarters in Houston and field offices throughout the active oil areas of the nation and in Maracaibo, Venezuela.

TESCO Installs Flexible New Furnace To Make High Alloy Steel Castings

With the recent addition of a new, flexible type furnace at Texas Electric Steel Casting Company, Houston, high alloy steel castings for heat and corrosion resistant applications have been made available on a commercial scale on the Gulf Coast.

Concentration of the chemical industries in the Gulf Coast has resulted in an increasing demand for stainless steel castings in the region, it was said. As a convenience to these operators, TESCO made an extensive study of the most efficient method of handling the correct alloy analysis to produce the finest type stainless steel castings for heat and corrosion resistant applications.

The new TESCO furnace is highly flexible and will handle castings from a few pounds up to more than a ton. These stainless steel castings are made to customers specifications.

Baroid Changes Address

Baroid Sales Division's Houston office is now located on the seventh floor of the new City National Bank Building, Houston. The Testing Equipment Department and Well Logging Shop will retain their present shipping and mailing address at 35 Artesian Place, Houston 2.

Visco Moves Offices

Visco Products Company, Inc., has moved its offices to 1204 City National Bank Building, Houston. The mailing address remains P. O. Box 234, Houston 1.

Houston Engineers Names Head Of Fishing Tools and Sales

W. F. (Bill) Carothers has been placed in charge of fishing tools and sales for Houston Engineers, Inc., Houston, succeeding R. M. Claypool, resigned.

The firm is undertaking an expansion program which will result in the marketing of a complete line of cutting and fishing tools in addition to reversing tool operations.

Carothers is returning to Houston Engineers after nine years in cutting and fishing tool work in the Gulf Coast area.

W. F. Carothers

Changes in Sales Personnel Force Announced by Orbit Valve Company

Jack H. Hancock, with headquarters at Oklahoma City, will represent Orbit Valve Company in Oklahoma and Kansas, succeeding T. G. (Ted) Harrington, who will represent Orbit in Southwest Texas. Harrington's headquarters will be in Corpus Christi.

Before joining Orbit's sales force Hancock was with Larkin Packer Company in Kansas, Texas and the Oklahoma Panhandle.

Effective September 1, Henry C. (Buz) Sawyer will be at the Tulsa home office. His territory of North and Central Texas and the Texas Panhandle will be served by Gerald G. (Jerry) Lowe, with headquarters at Wichita Falls. Before joining Orbit, Lowe was associated with United Supply and Manufacturing Company, and United Rig and Equipment Company, except for three years with the Seabees.

Buda Engine Representatives Meet at Dallas

Buda Engine & Equipment Company sales personnel met at Dallas to make sales and service plans. Pictured, left to right, are C. C. Kirk, Dallas; J. T. Bumgardner, Houston; J. W. Lowes, Jr., Houston; Kirk Rote, Houston; R. W. Leissner, Houston; W. Hiltpold, San Antonio; A. H. Benson, New Orleans; J. M. Bridges, New York; D. E. Roberts, Dallas; J. T. McFarland, Dallas; J. L. Joplin, Houston; J. C. Baseheart, Dallas; T. T. Horner, Houston; W. S. Jacobsen, Odessa; J. W. Hughes, Dallas; M. F. Sherrard, Dallas; R. S. McCauley, Kilgore; A. B. Froese, Houston; J. D. Warrick, Kilgore; J. T. Crawford, Jr., Madisonville; C. W. Clement, Dallas; D. L. Elliott, Wichita Falls; A. E. Rightsell, Pampa; N. T. Howell, Wichita Falls; E. F. Keith, W. L. Somner, Tinsley; and E. H. Groth, Dallas.

Wyoming Formations

To aid in the search for new oil fields in the Wind River basin of central Wyoming, a bulletin has been issued by the geological survey of Wyoming, Dr. H. D. Thomas, state geologist, announced.

The publication, entitled "Stratigraphic Sections of Mesozoic Rocks in Central Wyoming," was prepared by J. D. Love, H. A. Tourtelot, C. O. Johnson, R. M. Thompson, H. H. R. Sharkey, and A. D. Zapp, all geologists with the U. S. geological survey. The bulletin is a result of cooperative work between the U. S. geological survey, the geological survey of Wyoming, and the University as part of the program of oil and gas investigations in Wyoming.

Details of sequences of sedimentary rocks measured at seven places in Fremont County are described in the bulletin, with emphasis on character, thickness, areal distribution, and relative positions of potential oil producing sandstones and limestones throughout the state.

The probable depth to possible oil-producing formations and the nature of rock sequence to be drilled in test wells within the basin can be determined from the measured sections, Thomas said.

The bulletin is available from the geological survey of Wyoming, Science Hall, University of Wyoming, Laramie, for $2.

Practical Accounting

Practical Accounting for Oil Producers, by Robert M. Pitcher, has been revised to bring the original textbook up to date on problems pertinent to oil production accounting. First published in 1938, Pitcher's book has been used extensively by colleges and universities as an accounting text. The contents have been increased from 365 to 656 pages with illustrations of suitable forms.

The new material consists in the main of an interesting presentation of examples and specimen voucher entries to graphically illustrate the method of handling accounting for such vital information as problems faced under "free well" agreements, depletion record, how the depreciation ledger should be kept, and the purpose of using an "outside ledger" when it is only an intermediate record.

For the oil production accountant, it answers questions arising every day, such as how is an apparent "book loss" resulting from transfer of equipment from a producing leased handled for depreciation purposes? What procedures can be used in handling intangible development costs when expensed, when capitalized? On what elements of cost is depletion computed? How are "payments in oil" handled in the accounts?

Pitcher is currently teaching oil accounting at the University of Tulsa. His experience in the field of oil producing has been gained through 24 years of practical application of accounting in the industry.

The Gulf Publishing Company, P. O. Box 2608, Houston 1, Texas. Price $15.

Compressed Air Handbook

"Compressed Air Handbook" is a reference text on applications, installation, operation and maintenance of compressing equipment and air-powered tools of all types. The handbook contains, in revised and improved form, all of the standard reference material formerly published as Trade Standards. Included are definitions, test standards and numerous basic tables and formulae.

The object in editing "Compressed Air Handbook" was to provide a comprehensive volume of reference data which would meet technical and engineering needs and, at the same time, serve the layman and student with information on the wide versatility, flexibility and utility of modern compressed air power.

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SQUEAKS from the BULL WHEEL

Shining Example

"Rastus, what was de time in your life when you was de mostes' scared?"

"It was de time dat big nigger Sam come home and coth me with his wife."

"How you know you was mo' scared dan at some other time?"

"'Cause dat big Sam he turned to dat wife of his an' says, 'Mandy, what's dis white man doin' heah?'"

The Woman's Way

"My wife tells me that almost every night she dreams that she's married to a millionaire."

"You're darned lucky. Mine thinks that in the daytime."

Clear Understanding

"You're a cheat!" screamed one lawyer at another during a trial.

"And you're a liar!" was the comeback.

"And now," said the judge, "if these gentlemen are through identifying each other, we will proceed with the case."

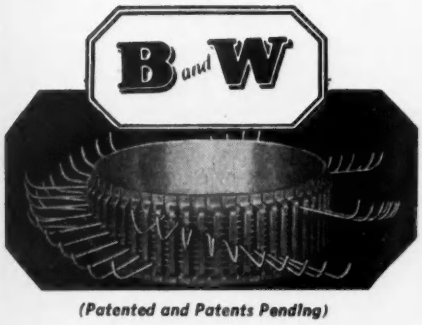
No Hoke, Son

"So you've been to California? What town?"

"San Jose."

"You pronounced that wrong. It's San Hosay. In California you pronounce all the J's as H's. When were you out there?"

"In Hune and Huly."



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Life Is Like This

Passing an insane asylum, he asked an inmate for the time.

The cloistered brother took out a foot rule, then a slide rule, a sun dial, a compass and a T-square. Five minutes later he announced triumphantly: "Four o'clock."

"Wonderful! But what do you do when it's raining and you can't measure the shadow?"

"Oh, in that case, I look at my watch."

Hints for Householders

"Last night a beautiful blonde I never saw before ran up to me on the street, threw her arms around me and kissed me. Can you imagine how I felt?"

"Sure. You felt to see if your purse was still in your pocket."

The Better Life

New resident: "How long must a man live here before he can vote?"

Town clerk: "What ticket?"

Excuse It Please

"Hello, is this Mrs. Williams?"

"Yes."

"This is Henry speaking. I say, dear, will it be okay if I bring a couple of friends home for dinner?"

"Why, certainly, darling."

"Did you hear what I said?"

"Yes, dear. You asked if you could bring a couple of friends home for dinner. Of course you can, darling.

"Sorry madam, I have the wrong number."

Signs of the Times

A landlord subject to terrible nightmares ran the following newspaper ad: "Room and board to couple who would not object to screaming in the night."

Came the dawn, his phone started banging, and a hopeful young woman inquired: "How many times a night would you require us to scream?"

It Often Happens

A farmer read a brilliantly-written ad about a book on "How to Grow Tomatoes." Thoroughly sold, he mailed his money and received the book. Shortly afterwards, he wrote the publisher: "The man who writ the ad shoulda writ the book."

Off the Hook

A fisherman was talking: "My line quivered under the strain. My pole bent double. My muscles groaned with the superhuman effort. But after a terrific three-hour battle I finally landed the monster."

"Pooh!" said his spoil-sport wife. "I saw a picture of that fish. Why, it didn't weigh a pound!"

"And what does that prove, my good woman? In three hours of fighting a fish can lose a lot of weight!"

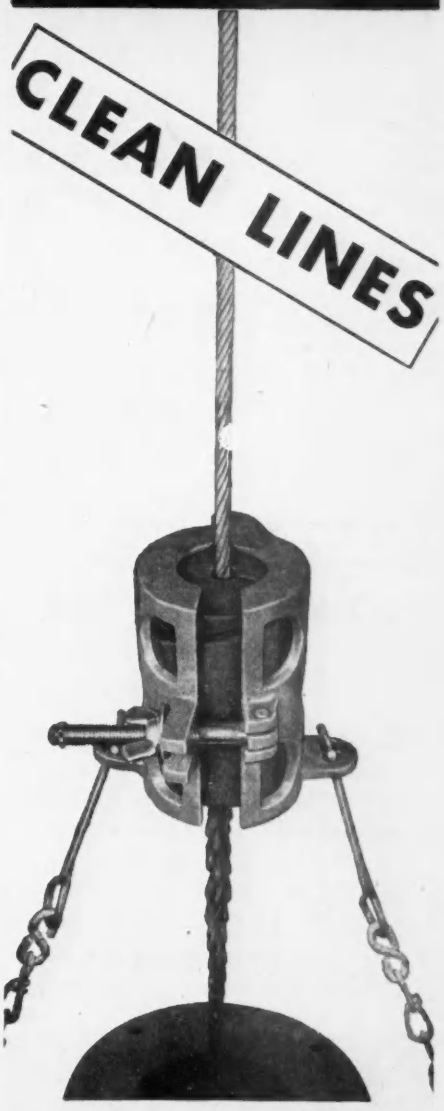
Questioned

"A vegetable diet will give you a slender figure."

"I doubt it. Did you ever take a good look at a cow?"

"Best Bet Yet"

CLEAN LINES



A clean wire line helps your crew. They can work safer and better on a clean floor, free from drippings. With a Patterson-Ballagh Wire Line Wiper the line is stripped completely of mud and oil. A compact steel housing contains a spiral rubber which is inexpensive and easily replaced. The rubber wipes the line as it comes out of the hole. Spark-proof. Use one on every well.

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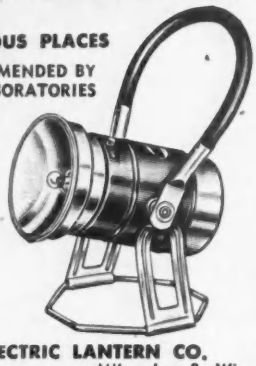

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